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Language Concepts and Children's Classification Strategies

Karin Aronsson

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Language families and linguistic classification strategies

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The present dissertation is based on the following two monographs, referred to in the text by Roman numerals as respectively:

- I Aronsson, K. (1975). Egologic and standard-logic in concept organization. A developmental study of sorting strategies. Psychological Research Bulletin, Lund University, No 1 Monograph Series.
- II Aronsson, K. (1978). Bilingual organization of antonyms and children's classification strategies. Psychological Research Bulletin, Lund University, No 2 Monograph Series.

Chomsky has turned our attention to the remarkable feat of the child's first-language acquisition; how the child in a relatively short time construes a working grammar out of the fragmented and incomplete flow of speech to which he is exposed. Thus, research efforts concerning psychology of language have of late to a great extent been concentrated on the under-fives and their linguistic accomplishments. Language development at later stages has not been favoured in empirical research (cf., Palermo & Molfese, 1972). This is regrettable for practical as well as theoretical reasons. In applied situations, it is obviously useful to know in what ways the child's potential as communicator is limited by insufficient language competence (relative to some adult standard). Also, theoretically, any deeper understanding of language acquisition must take into account not only when and how language acquisition commences but also when and how different sub-components can be said to be more or less fully developed.

Concept development was studied with regard to the organization of common concepts. It was argued (study II) that the gradual acquisi-

tion of unusual concepts is trivial; e.g. the child's acquisition of terms such as AMBERGRIS says little about general cognitive development and more about the child's prior exposure to those quite special situations where AMBERGRIS is referred to. Accordingly, it was thought that it would be more informative to explore the organizational development of common terms such as HIGH-LOW (or those of the type employed in study I - ANIMAL, RED, ROUND).

The main focus of both studies was on such concepts in use. That is, if the child is familiar with certain concepts, to what extent would they be available for use on appropriate occasions; e.g. in his verbal and non-verbal classification strategies? This question concerns the development toward increased accessibility (stabilization) of terms. In line with the general framework of Werner (1957), it was assumed that the conventionalization of terms would entail increased stability on the one hand and hierarchic integration on the other. What is the operative status of a given term in the child's cognitive organization, and is it (within certain language domains) possible to rank different terms with regard to their relative order of stabilization? Study II also contains an important additional perspective in that it extended the investigation to bilingual development (Finnish-Swedish). Obviously, any regularities found are of greater general interest if they are not confined to one given language.

Since both studies concern the relative accessibility of certain basic concepts (and not the initial acquisition), the subjects were recruited from the 4 - 9-year-old bracket, as this age group can be expected to have passed the primary stage of first-language acquisition. As for the bilingual sample (study II), Finnish is the first-language (L1) of these subjects in that they have all been exposed to Finnish since birth, whereas the second-language (L2), Swedish, has been introduced at some later

stage (usually when the children were old enough to play outside on their own).

O n d e f i n i n g L 1 and L 2

The terms L1 and L2 are used extensively in the present work. Since these terms entail quite intricate problems of definition, it seems that they merit a separate analysis (cf., Christophersen, 1973). The chronological definition adopted in the present study is definitely not the only possible one. There are several alternative perspectives; "objective", phenomenological, and functional ones. One alternative way of defining L1 would be in terms of the subject's strongest language according to some objective standard. It is easy to see that such a definition raises several problems - one of the main ones being the multi-dimensional character of language competence; e.g. what would be the L1 of an individual whose semantic competence is stronger in one of two languages and whose phonological competence is stronger in the other?

One way to obtain a more global index of language dominance would obviously be to ask the subject himself. This apparently straightforward approach is, however, complicated by social issues such as type of cultural membership (majority - minority culture) and public attitudes bearing on the social prestige of L1 and L2. One could, naively, assume that children are less influenced by matters of social desirability. Yet, results obtained in connection with study II clearly indicated that this is not the case. The fifty subjects were all asked about their language dominance; by a Finnish-speaking and by a Swedish-speaking interviewer, some weeks apart ("You speak Finnish and Swedish - which language do you feel that you speak the best?"). It was predicted that the child would be influenced by the language spoken by the interviewer in such a way that he would be more inclined to answer "Swedish" when asked by a Swedish and not a Finnish interviewer and vice versa. This was also borne out by the data in that those subjects who were affected by the interviewer were so in the predicted direction (Table 1).

Table 1. Deviations in the subject's reported language dominance as a function of language spoken by the interviewer.

Language reported as dominant

Finnish-speaking
interviewer

Swedish Finnish Both N=50^a

Swedish	(6) ^b	11 ⁺	2 ⁺
Swedish speaking Finnish interviewer	1 ⁻	(21)	2 ⁻
Both	2 ⁻	3 ⁺	(2)

^a 29 subjects who responded consistently (ties), and 21 subjects affected by the language spoken by the interviewer.

^b Direction of difference; predicted direction +; opposite direction -; ties within parentheses.

Sign test; N = 21, x = 5; one-tailed

p<.013

Along similar lines of reasoning it could be argued that parents would be more prone to assess their children as bilingual than the children themselves would be; i.e. parents would overestimate the child's language competence somewhat, as bilingual competence (all other things equal) would be socially desirable. Furthermore, the parent's more limited frame-of-reference with regard to what characterizes native-like performance might lead to overestimation of the child's L2 competence. The results do not indicate which factor is most important, but they do provide further substantiation of the notion that self- (or parent-) reports of language competence may be quite contaminated (Table 2).

Table 2. Bilingual proficiency according to the child himself and according to his parent.

		Language reported as child's dominant one		
		Child's own assessment when asked by the Finnish-speaking interviewer		
		Swedish	Finnish	Both
Parent's ^b assessment	Swedish	(1)	(3)	1 ^{-a}
	Finnish	(2)	(17)	3 ⁻
	Both	6 ⁺	14 ⁺	(2)

^a Direction of difference: predicted direction +, opposite direction -, non-relevant cases within parentheses

^b Parent-interviews made one or two years prior to the present study (as part of the bilingual-bicultural program; interviewer = the same one who tested the children in Finnish). The time lag should work against the present predictions rather than for, as more children would become bilingual with increasing exposure to L2, other things being equal. Parent-interviews available for 49/50 children.

Sign test; $N = 24$, $x = 4$; one-sided

$p < .001$

A different approach would be to define L1 in terms of its primacy in the subject's intimate daily life or, more concretely, in terms of the language spoken at home. This definition, when applied in the present case, is complicated by the fact that most of the subjects concerned, 84%, belong to families where more than one language is spoken (as reported in the parent-interviews). The language spoken at home has to be further defined in terms of by whom to whom and

ing knowledge. Moreover, these terms have great metaphorical potential as indicated by a large number of idiomatic expressions; UNDER AGE, UNDER COVER, NARROW-MINDED, NARROW ESCAPE (cf., "SMÅLA LYCKA", in Swedish) etc.

The complexity hypothesis

In addition, powerful concepts are good candidates for linguistic universals, assuming that languages primarily express those categories and relations that are somehow more basic and important than others. This reasoning presupposes that it is possible to formulate some kind of order of complexity between word concepts (within certain language domains), singling out the more basic or less complex concepts. Such a complexity order, if proven for bilingual development, would go against the qualitative-difference hypothesis (which posits different acquisition processes in L1 and L2).

Clark (H. Clark, 1973) has formulated a complexity hypothesis, predicting the order of acquisition for spatial terms. This model defines complexity order in terms of the child's varying difficulties in mapping basic notions of the world onto language. One determinant of difficulty is man's biological perceptual apparatus. The ordinary upright position - the canonical position - defines what is cognitively more natural and what is less natural, more complex (cf., Figure 1). Thus, when a person stands, the space in front of him, above the ground, is optimal for perception by eye, ear and touch (Clark & Clark, 1977). Upward and forward are thus natural directions relative to downward and backward. For instance, the term UP will thus be acquired before DOWN. Clark maintains that what is natural is also indicated by linguistic polarity conventions. On the basis of linguistic theory (c.f., Bierwisch, 1967; Greenberg, 1966), Clark maintains that antonym pairs such as LONG-SHORT, WIDE-NARROW can be differentiated in terms of positive/nega-

something more than merely vocabulary growth. One of the main aims of study I was to devise such a technique. The method in question involves free sorting (production) and identification of the experimenter's sorting principles (comprehension). The sorting material consists of 9 picture cards, constructed to fit a priori classifications that give exhaustive and logically consistent descriptions of the material. The set of cards could be sorted according to three such strategies; colour, form and meaning. The cards were designed in such a way that a sorting based on any of the three dimensions ruled out the possibility of any other simultaneous adult-type sorting. Such adult-type strategies were named "standard-logical" strategies, referring to their relation to concept usage according to a public standard. Standard concepts should be envisaged within language-linked rationales for relating different terms to each other. It is this type of logic that states that there are more ANIMALS than DOGS and more DOGS than TERRIERS; i.e. the kind of logic which is expressed in the class logic of a given language. In contrast to this, child-generated systems of meaning or what was referred to as "egological" systems involves a logic based on the individual's personal experience and subjective point of view. The suffix "logic" serves to indicate that egologic nevertheless involves consistency and reasoning, even if it may be a different type of reasoning from that involved in standard-logical strategies.

The results showed that the 120 subjects, aged 4 - 9, gradually employed standard-logical strategies to a greater extent; the sequence being: egological preference - - mixed preference - - standard-logical dominance. The same trend appeared on the plane of comprehension (younger subjects having great difficulties in understanding more than one or two of the standard-logical strategies presented by the experimenter). This is a matter of considerable importance. Those classification studies which only employ production tasks are difficult to interpret, since failure to use standard concepts (as bases for his sortings) may well be due to the subject construing the experimental situation differently (than intended by the exper-

imenter) and not to his being unattuned to standard categorizations. In any case, the present study, employing a comprehension task, showed that even if a given subject "knows" such terms as COLOUR, FORM, ANIMAL, neither do the underlying concepts necessarily form the bases of his classification strategies, nor is it certain that he will understand these categorizations when employed by others. Most younger subjects were able to understand at least one standard-logical strategy. Their relatively insufficient understanding primarily had to do with their difficulties in dealing with criterion shifts; i.e. in shifting between the three different standard-logical strategies on the plane of comprehension.

The standard-logical orientation was thus defined by the subject's relative flexibility (ability to shift criteria) within the realm of standard concepts. Standard-logical strategies, being linked to a shared system of conventions are better adapted to most types of formal social interaction (such as communication at school) than egological ones. Thus the standard-logical orientation could be regarded as an index of (school-)socialization.

In connection with the demonstrated gradual increase in the use of standard-logical strategies, the question was asked whether egological categorizations would still be available to the standard-logically oriented child. This question was not explored within the present two studies. However, in connection with study II, the fifty subjects participating in that study were presented with "egological" sortings (sortings which could only be explained in terms of contextual association of the type "the people live there" etc). Most of the children had difficulties in seeing these sortings as meaningful. However, the standard-logically oriented ones were slightly better at adopting this more "primitive" perspective; 32% of these subjects, compared to 23% in the ego-

logical group managed to envisage contextual meanings that could fit at least one of the two sortings presented. This finding, while highly tentative, suggests that a less conventionalized conceptual orientation (egological one) does not necessarily entail greater comprehension for the subjective perspective of others. Phrased differently, this shows that the egological orientation is associated with a relatively insufficient ability for decentering which is not overcome by the introduction of more child-like material.

Study II

The complexity hypothesis

The standard-logical orientation (study I) thus referred to the subject's capacity to decenter. Study II is also concerned with this capacity in that it explored to what extent concepts linked to the most ego-centered ("natural") perspective would also be the ones to be acquired first and whether such a potential order of complexity would also hold for both languages in question.

This exploration was based on what has been referred to as the complexity hypothesis. This hypothesis as presented by Clark (Clark, 1973) posits an order of acquisition for spatial terms on the basis of what is more natural and what is less natural (more complex), which, in turn, is defined by polarity conventions, where positive/negative polarity (e.g. WIDE⁺, NARROW⁻) correspond to less/more complex. Complexity was also defined in terms of the "canonical" position, man's ordinary upright position (above the ground), where that which is less complex can also be described in terms of "within sight" (cf., IN FRONT OF⁺, BEHIND⁻). Backward is thus complex relative to forward; downward relative to upward etc. The order of complexity has earlier been proven for English (Clark, 1972). It was assumed that the complexity hypothesis would be considerably strengthened if it would hold for two more languages, particularly as the two are quite different from each other.

Subjects were fifty immigrant children; thirty 6-year-olds and twenty 8-year-olds. As in the sorting experiment (which was also administered to these subjects), the main experiment of study II - an antonym experiment - involved one comprehension and one production part. Fifteen pairs of antonyms were employed in these tasks. In the comprehension task, subjects were to identify pictures matching the target antonym words. In the production task, antonyms were elicited in a "game-of-opposites".

The results supported the complexity hypothesis in several different ways. First, in comprehension, the expected order of complexity was shown in the subject's greater mastery of positive relative to negative pair members. This advantage of positive over negative appeared in both languages. Second, in production, the L1 frequency ranks (of words produced) correlated significantly with the L2 order of complexity. Third, the subjects' substitutions for the correct target antonyms, here referred to as their "errors", were noteworthy in that the same ones appeared in both languages. Parenthetically, the errors were in most cases quite sensible ones; e.g. the children who answered FIRST-SECOND (and not FIRST-LAST) most likely construed the task in terms of their concrete experiences of competitions where the first/second opposition may indeed be an important one. Also, the errors were economical in the sense that the substitute words tended to be less complex than the replaced ones. Last, but perhaps most strikingly, the errors were similarly organized in the two languages with regard to orders of frequency.

The similarity between L1 and L2, with regard to error- and acquisition patterns, is impressive for several reasons. The two languages belong to different language families, the Finno-Ugric and the Indo-European. Surface features, such as word length and phonological complexity, vary considerably between

the two languages. Also, it appears that even if the children have learnt the terms in a similar order, they have not learnt them simultaneously, as the majority mastered more terms in L1 than L2. It is thus not obvious that L2 patterns should agree with L1 patterns. Further, the word pairs employed are familiar ones (or at least partly known), and the age groups in question are well past the stage of initial language acquisition. The associations between the L1 and L2 complexity patterns evidently reflect quite a subtle organization. Thus, when summarized, these between-language correspondences convincingly demonstrate the general cognitive (as opposed to language-specific) base of the children's bilingual concept organization.

In addition, the polarity results are of interest in that they reveal similar organization not only regarding complete mastery of word pairs, but also with regard to partial comprehension. Similar partial mastery was also indicated by the positively correlated rank orders of errors produced (L1 x L2). Moreover, most errors were of the appropriate word-class and language domain, which is another fact that reveals the child's gradual construction of word meanings. This step-wise development toward conventional categorizations lends strength to constructivist theories of language acquisition (e.g. Werner & Kaplan, 1964). Thus, a basic assumption, borne out in the present investigation was that it is not the case that the child "has" or "does not have" a given word concept (even if it be a familiar one) but that concepts develop gradually in functional accessibility and hierarchic integration.

It could be argued that L2 is modelled on L1, and that this would explain the correspondence between the two languages. However, this does not predict the agreement between the present results and those of Clark (1972) - as it can hardly be the case that the present subjects have modelled their L1 Finnish patterns on unfamiliar English ones.

The agreement between the three languages indicates some kind of universality. However, the relevant cultures are quite similar, which means that it is hardly warranted to discuss the present results in terms of universality in any more definite sense. As indicated by the term STANDARD-logic (and this also applies to the antonym experiment), we are not discussing an ultimate logic but norms anchored in the lexicon conventions of a given language. These norms, in turn, express the social realities of the language communities concerned. Thus, we could, for instance, conceive of a cultural group (e.g. of cave-dwellers) for whom DOWN might be the less complex term (and not UP).

As indirectly indicated, the gradual acquisition of the more complex terms involved a prolonged acquisition process, not yet terminated among the 8-year-olds. This finding is relevant for the hypothesis that there is a critical period for language acquisition such that young children have a superior capacity for language acquisition (here referred to as the speedy-acquisition hypothesis). Different ages have been proposed for this period, but a stronger version of the hypothesis would implicate the 2 - 5-year-stage as the critical period (cf., McLaughlin, 1977). This hypothesis was not supported by the present findings in that they indicate that language acquisition is not a speedy matter either in L2 or in L1 (in view of the age groups and concepts employed). On the other hand, the present findings do agree with constructionist theories in that they show how concepts are slowly reconstructed by the child.

Some of the younger subjects revealed zero or close to zero performance on the Swedish production task. Yet, for most of these subjects, Swedish has for many years been a "natural" language (cf., Christophersen, 1973) in the sense that it has been spoken in their daily lives in non-school settings;

in streets and play-grounds, on television etc. However, as described elsewhere (Aronsson, 1978), exposure (whether in small or great amounts) cannot be equated with learning. For one thing, the child may get along quite well by decoding contextual cues for meaning - thus bypassing comprehension of the verbal messages. Also, in those situations which ordinarily demand verbal production, the child may often cope by employing alternative communicative strategies (non-verbal ones or ritualized sets of phrases). Further, some of the more intellectual children appear to be hesitant about using L2 for more elaborate discourse, sensing that that they can only express part of their cognitive potential in the weaker language (cf., Aronsson, 1978). Thus, predictions of young subjects' L2 development, even more so than for older persons, must take into account the social matrix (type of social contexts and functional value of L2 comprehension/production) within which it is to develop.

Conceptual orientation and mastery of antonyms

This study also provided further substantiation of the egologic/standard-logic distinction in that it showed how the standard-logical orientation was related to other types of accessibility. Standard-logical subjects produced more correct antonyms than the other subjects. However, this relationship did not hold for the L2 productions of the younger subjects. This was predictable in view of the fact that social contextual factors evidently are quite important for early second-language acquisition (cf., previous discussion). Otherwise, the standard-logical orientation was, as shown, associated with greater production of antonyms - in L1 and L2.

In accordance with the framework of the present two studies, there was no significant association between standard-logical orientation and degree of comprehension; i.e. the standard-logical and egological subjects did not differ with regard to their understanding of the antonyms. The fact that standard-logic is a mat-

ter of concept accessibility (and not mere word-knowledge in a more mechanical sense) was demonstrated even more clearly in a concomitant analysis which showed that the discrepancy between L2 comprehension and production was less among standard-logical than egological subjects. The L2 mastery of the standard-logical group was more stabilized in that they tended to show greater "production-ratios". What is meant is that the standard-logical children (relative to the egological group) could produce a greater proportion of those concepts which they had in fact understood (as indicated by their performance on the production task relative to the comprehension task).

The association between conceptual orientation and performance on the antonym task is illuminating in that it shows how one type of concept accessibility (use of concepts in sorting) is related to a different type of accessibility (production of antonyms). The tasks were quite different as were the language domains (e.g. colour terms versus spatial terms), yet both types of experiments tapped a stability dimension of concept organization.

One factor working against early conventionalization of spatial terms is thus, the presence of child-generated systems of meaning (as the egologically oriented subjects acquired these terms more slowly than same age peers oriented toward standard-logic). On the other hand, the language itself also offers a certain resistance which was most clearly demonstrated in those cases where a given concept was mastered better in L2 than L1, e.g. LAST. Most such differences between the relative orders of acquisition in L1 and L2 can be explained in terms of the differentiation demands made on the child, as is the case with LAST where there are more alternative expressions in Finnish than Swedish.

C o n c l u d i n g r e m a r k s

However, within the conditions of the present work, complexity was, only in certain cases, language-specific. The main tendency indicated complexity defined by a common cognitive organization (determining the order of acquisition in L1 and L2). There is empirical support for the complexity hypothesis (with regard to English, see Clark, 1972). The present findings provide quite solid additional support in that they concern two more languages - and two quite different ones.

It could be argued that the related orders of complexity ($L1 \times L2$) might be due to similar word frequencies in the languages concerned. That is, the more frequent words are also the ones that are stabilized first. However, this hypothesis does not predict either the occurrence of substitutions or the systematic order between these substitutions. Further, as pointed out by Clark (1972), it might be more meaningful to argue that word frequencies are the results of some semantic or cognitive complexity than the other way round.

The present two studies involved the construction of new instruments devised in such a way that they could be used to assess production and comprehension of language concepts. Obviously, the present discussion in terms of comprehension and production is limited by the measurements employed. Thus, both studies concern only one part of language competence - semantic - and only certain aspects of this competence. Also, it could be argued that the experimental situations (sorting of cards and production of antonyms) are slightly artificial. This is, of course, true. On the other hand, this is also true for much of everyday work at school, where children have to operate with words in vacuo.

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Egologic and Standardlogic in Concept Organization
A developmental study of sorting strategies

by Karin Aronsson



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A b s t r a c t. - Investigated organization of language concepts in a group of 120 children, 4-9 years old. Subjects were to apply sorting strategies to nine picture cards, each differing in colour, form and representation. The strategies named egological were most common amongst younger children, their reports being based on partial identity, on one hand, and on diffuse family resemblances on the other. Egological concepts of a pseudological type were almost exclusively overly narrow. Strategies termed standardlogical increased in accessibility with age, the developmental sequence being: non-comprehension - comprehension - production, and in functional integration as shown in criterion shifts.

I n t r o d u c t i o n

Within the field of concept development studies, the distinction between perceptual, functional and conceptual criterions has been a long cherished one. According to this research tradition, perceptual distinctions are acquired earlier than functional ones, and the functional ones earlier than so-called conceptual ones. For example, functional categorizations, like 'edible', are thought of as more primitive than conceptual ones, like 'fruit'. It is, however, far from proven that this distinction is really a substantial or even important one. Certain functional concepts, e.g. 'you can eat it', may be quite primitive in the sense that they are acquired early in the child's life, but what about other functional concepts such as 'front-wheel drive' or 'predicate phrase'? Would these concepts be more natural to the child than 'car' or 'word'? This is apparently not the case.

Neither need perceptual groupings be acquired at an earlier stage. It has been proven that children tend to apply perceptual distinctions like 'red' earlier than conceptual ones, like 'fruit', but this order of difficulty does not seem to hold if the child is presented with a more sophisticated perceptual property, like 'metal' (cf. Sigel, 1953).

Thus, which hierarchy of criterion complexity is formulated is to a large extent dependent on what is put into the material. In the instances cited it is apparently the case that the child's expe-

rience of the world determines whether a perceptual, functional or conceptual distinction is the more complex one.

The present report will adopt the view that all three criterion types are conceptual in that they refer to classes. The previously established hierarchies of complexity are, as shown above, determined by the specific stimulus material. Furthermore, all three criterion types are classes, on one hand, since they do not refer to singular objects, and on the other, since they all require of the child that he disregard criterion-irrelevant differences between concept instances. In addition, neither the "conceptual" nor the functional nor the perceptual type refers to a class in a stricter sense, since they all can have concrete referents.

One issue underlying the above is the matter of usage frequencies. It can well be called into question whether class-names, popular within concept development studies, like 'vehicle' or 'tool', are actually encountered by the young child in everyday discourse. If the child is not familiar with the word, there is little reason for him to group such diverse objects as a car and a pram together, or a spoon and a hammer (especially as they would probably not be found together in the child's home). The fact that the child does not use the concept in his categorizations is therefore of little theoretical significance. The study of the child's use of the word concepts already known to him to some extent, obviously involves further reaching implications.

Therefore, it seems important to investigate the relation between the child's use of such concepts and the conventional or public concepts, the standard concepts (cf. Flavell, 1970). Accordingly, this study is concerned not with the child's original acquisition of word concepts but rather with the processes involved in stabilization and integration of the use of con-

cepts that the child already knows to some degree (even if he does not operate with them as does an adult).

Egological and standardlogical concepts

Are standard concepts altogether conventional? Are they totally standardized with regard to content and extension? This is hardly the case, rather, each concept has a core of conventional elements (Werner & Kaplan, 1964). Different concepts, and the concepts of different individuals, vary as to how great a proportion of the meaning can be described in terms of a set configuration of semantic elements.

The term standardlogic is used here to denote the kind of logic which is inherent in the class logic of a given language. It is this type of logic that states that there are more animals than dogs, and more dogs than terriers. The prefix "standard" is employed as a reminder of the fact that we are dealing with linguistic conventions, i.e. a logic transmitted by the conventions for language use. Egologic, on the other hand, is defined as a logic based on personal experience and on the subjective point of view. The suffix "logic" indicates that egologic nevertheless involves a certain consistency or logic, even if it is a different type of logic from adult standardlogic.

There are more egological elements in the concept organization of the younger child than in that of the older child (cf. Werner & Kaplan, 1964). This increasing conventionalism, the standardization of concept organization, with increasing age, imply that the individual's core concept will coincide more and more with that of the standard concept. The two types of logic are, at the present stage, deliberately defined quite loosely, since one aim of this study is to arrive at a more precise way to describe their meaning.

The distinction between egologic and standardlogic refers to cognitive operations, and not to the actual symbol forms. A symbol

form, per se, is neither egological nor standardlogical. Only through studying how the child operates with a certain symbol form, in his language use, is it possible to define the extension and intension of a given concept in the child's concept organization. It is possible, for instance, to differentiate between the concepts 'human being', 'house' and 'animal' as follows:

Human being:	Animal:	House:
+alive	+alive	-alive
+potential for talking	-potential for talking	-potential for talking
-place to live in	-place to live in	+place to live in
-built by humans	-built by humans	+built by humans

The child, who in a sorting task, puts all human figures together "for they can talk" does express an awareness of one of the essential components in 'human being'. This type of categorization is more properly regarded as standardlogical than is one phrased in terms of "human being", but where, for instance, all red-headed or all child figures are excluded. In order to understand the child's logical disposition better, it is therefore necessary to study both the empirical referents, i.e. the child's sortings, and his verbal definitions. Only then is it possible to determine whether or not the form and content of the child's concept coincide with that of the standard concept.

Standardlogical strategies in concept organization

The primary aim of this study was to describe how the child forms systems of standardlogical concepts. These systems were expected to be characterized by an age-linked increase in articulation, differentiation and hierarchic integration, according to the orthogenetic principle of development (Werner, 1957). The increasing differentiation and hierarchic integration could be defined as a successive increase in the child's capacity to classify empirical data in an exhaustive and logically consistent fashion, as well as in his capacity to classify the same

data in several ways. This capacity, that is only rudimentary in preschool children, becomes progressively refined in older children (Inhelder & Piaget, 1964; Vygotsky, 1962).

The increasing articulation ability manifests itself in a greater capacity to define a given concept. The older child's greater skill in defining concepts has been noted by Werner (1948; Werner & Kaplan, 1964), as well as by Inhelder & Piaget (1964). It is apparently also the case that articulation is dependent on systemic integration:

To us it seems obvious that a concept can become subject to consciousness and deliberate control only when it is a part of a system. (Vygotsky, 1962, p 92).

If one wants to identify such systems in the behaviour of the child one might, for instance, ask whether a child, capable of identifying certain colours will also, in fact, operate with a colour criterion, if he is given multi-criterion material to classify. The supraordinate classificatory principle will here be referred to as symbol strategy (or sorting strategy where a sorting task is concerned).

Accordingly, it can be seen that a standard logical sorting strategy is a logically consistent strategy, i.e. a strategy where the concepts are appropriate in extension and intension. This means that all appropriate elements, and no other, will be included in each grouping. In order to understand how the child's conceptual systems are organized, we should therefore study his symbol strategies.

There is an indefinite number of egological strategies, since these strategies are related to the individual's subjective perspective. There is also an indefinite number of standard logical strategies, but the stimulus configuration in a given context sets limits on the number of viable strategies. A complex stimulus configuration, such as, farm-house material could thus be structured according to,

say, three different standardlogical strategies.

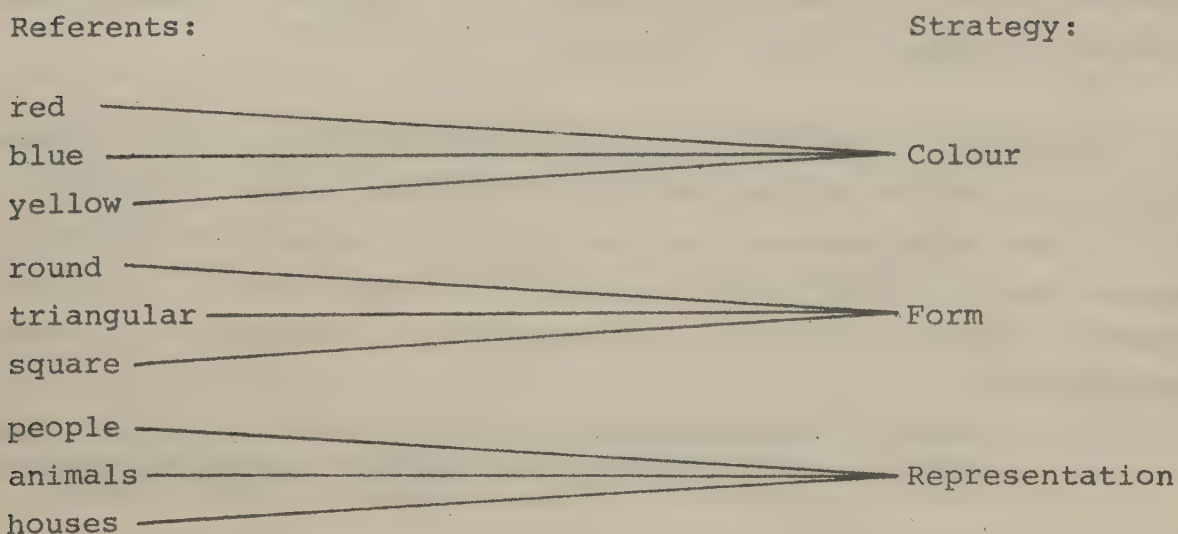


Figure 1. Symbol strategies.

Each strategy allows for an exhaustive and logically consistent description of the material, and in accord with the arguments to be found above, no strategy could be said to be more "primitive" than another. A given standardlogical strategy may of course vary in frequency between different age groups, for one and the same stimulus material. It is, however, by no means evident that such age-linked differences would hold for other stimulus configurations. A figural strategy, like the colour strategy, for instance, probably becomes more accessible to the subject depending on the extent to which the colours stand out in the stimulus configuration.

Accessibility to standard concepts

Early concepts are context-bound, whereas later concepts are relatively context-free, i.e. comprehension and production of these concepts is not tied to any one type of context. The more a concept is set free from a certain concrete situation, the more it will approach the logical sphere, and the more it will be characterized by certain essential components, which give it stability and consistency (Werner, 1948, p 284).

Flavell and others have recently argued in favour of exploring the stability of the child's thinking, the permeance of a given mode of cognitive functioning. To what extent can someone be said to "have" a certain operation (Flavell, 1970)? The greater part of developmental research within the Piaget tradition sets out to identify if a given subject masters a certain strategy, while Werner has also focused on when and how.

The latter type of approach is concerned with identifying different types of experimental situations, where there is variation in the subject's ability to apply a given strategy. This approach might not be theoretically interesting per se, but the point in question is to identify general displacement of difficulty. i.e. variability in accessibility that is theoretically meaningful. Werner & Kaplan (1964) contribute by showing that certain concepts are completely context-bound before they become applicable outside the initial context. Accessibility may also (for the purpose of the present discussion) be expressed in terms of different performance levels. The more stable a strategy is, the higher will be the so-called performance level. With regard to concept development, the performance levels may be hierarchically arranged in the sequence: recognition - comprehension - production.

The present study has focused on concepts that the child has already mastered on a superficial level, like 'house' and 'dog'. The study will thus only be concerned with concepts that the child does recognize. The question is: does recognition tend to coincide with comprehension and production, or is there a sequential development, as suggested above? Werner & Kaplan (1964, p 101) have shown how sounds may undergo a shift of function from purely imitative to depictive.

The present study is based on the assumption that common word concepts undergo analogous shifts of function from a recognition plane to a plane of comprehension or production. This implies that the

child acquires the word concept in steps rather than in an all at once way.

The rigidity-flexibility dimension

Development proceeds toward stability, on one side, and toward flexibility, on the other. The more differentiated and hierarchically patterned behaviour becomes, the more stable and the more flexible it will be (Werner, 1948). While lability implies vacillation between different strategies, flexibility implies deliberate, intentional movement between different strategies. Flexibility is thus linked to a certain awareness. This awareness manifests itself in the child's capacity for reconstruction and planning.

The ability to "shift" criteria, once achieved, allows the subject to consider a collection of objects from several points of view - either in succession or simultaneously. This is a characteristically conceptual activity rather than a perceptual one. The early interplay of the processes of anticipation and retrospection lay the groundwork for this later ability to "shift". When the child is able to predict several possible ways in which objects might be classified (at about 7 to 8 years or older), his mode of expressing anticipation gives evidence of his retrospective process. For example, he will say: "Must I first classify them by color and then by shape or size?" (Inhelder, 1970, p 31)

With increasing age and maturity there is thus an increase in freedom, where a given stimulus configuration is concerned, a greater capacity to switch from one standardlogical strategy to another (Werner, 1948; Werner & Kaplan, 1964).

The problem area

The general purpose of this study was to explore the function of standardlogic in the child's concept organization. The use of standardlogic was expected to increase, with age, in that the subject's (i) ability to use standardlogical rather than egological strategies would develop. A basic assumption, in the present investigation, was that one does not "have" or "not have" a given

concept (in the sense that one has the capacity to scream) but that concepts develop gradually in accessibility and precision. It was therefore predicted that the children, with increasing age, (ii) would increasingly operate with a given standardlogical strategy across performance levels, and (iii) would be able to switch between different standardlogical strategies more and more. Previous research has been mainly concerned with flexibility in the child's own sortings, and not with assessing whether or not he would be able to comprehend criterion shifts. The present study was therefore designed to answer this question as well.

In order to explore the mechanisms behind the increases in standardlogical concept organization (according to hypotheses i - iii above), it seemed worthwhile to undertake an analysis of (iv) the relative distribution of the three different types of standardlogical strategies, and of (v) the content and form of the egological sortings.

(iv) Previous research has suggested that there would be frequency differences between the different types of standardlogical strategies. Sigel (1954) has observed a dominance of representation classifications over classifications based on figural aspects. Bearison & Sigel (1968) presented similar findings, representation matchings (in terms of 'houses', 'trees' and 'clocks') being more frequent than form- or colour matchings. Thus, in both cases, the meaning of the objects rather than stimulus properties like colour or form were the determining factor in the children's discriminations. The results are, however, not generalizable without certain reservations, since representational aspects are dominant in the former study, and figural properties dominate in the latter. The representational elements are apparently quite unambiguous in the latter study. The report indicates that one probably could not project more specific meanings into the pictures, such as +birch, +pine for 'tree' or +cottage, +mansion, +castle for 'house'. The present experiment was an attempt to examine the generality of

these earlier findings, with a semantically complex material where the figurative aspects are still rather prominent.

(v) Picture material of the present type would stimulate the children to verbalize their egological strategies, and in addition these reports would form an important basis for the interpretation of the children's standardlogical behaviour. A special point of interest would be the relative frequencies of wholly egological concepts as opposed to non-succesful approximations to standardlogical concepts (pseudoconcepts). It was predicted that the pseudological concepts would be under-inclusive, which has been found to be the case in earlier experiments (Saltz & Sigel, 1967; Saltz, Soller & Sigel, 1972). This would be in line with Piaget's (1969) reasoning that supraordinate syncretic schemes of meaning can result in overly narrow and isolated concepts.

M e t h o d

Subjects

The 120 children were enrolled in public nurseries and in an elementary school in Lund.¹ Twenty boys and 20 girls, in the age groups 4:5 - 5:0 years, and 6:5 - 7:0 years, were recruited from public nurseries. The school age group was composed of 20 boys and 20 girls, aged 8:5 - 9:0 years, from two grade 2 groups, and a random selection from a third grade 2 group in the same school. The sample included all the children within the appropriate age range, except two who were considered retarded by their nursery school teachers. A Piaget experiment was administered in order to ensure that the children were not maturationally atypical. The experiment used - conservation of matter - was administered in a traditional way (Piaget & Inhelder, 1941), employing two types of transformations (into a sausage- and a pancake-shape). The response was scored as concrete operational if the child on both trials understood that the quantity of clay was the same. The

¹The author wishes to thank Svenhög School, the nursery school personnel and all the children for their co-operation.

proportion of concrete operational children, thus defined, was 5 % in the 4-year-group, 42 % in the 6-year-group, and 72 % in the 8-year-group, which indicated that the children were quite normal with regard to cognitive maturity.

Procedure

Subjects were examined individually in a single session. The tasks were administered in the following order: conservation, production of sortings, and identification of the experimenter's sorting strategies. They were preceded by a simple form-colour-size sorting task, which will not be reported here.

On the rare occasions when the child neither used nor understood standard logical word concepts, the experimental session was terminated by a simple check of the child's word recognition.

Presentation of sorting technique

A three step procedure was used where the subjects were asked to:

- 1 sort the picture in an optional number of classes
- 2 verbally motivate each sorting
- 3 identify the experimenter's sorting strategies

This technique had the following advantages:

(i) The sorting was "free" which meant that one could study the subject's concept disposition. Free sorting is close to an ordinary play situation, and thus a natural task to the child. Most subjects rather enjoyed the task.

(ii) It was possible to follow the child's operations in a step by step fashion. This meant that one could answer questions such as: does the child follow an articulated plan? Does he need to ponder at each sorting, or does he immediately "see" the different sorting criteria? Does he offer one or more motivations for each sorting?

(iii) The third step made it possible to distinguish between sub-

jects who understood but did not use a given type of strategy and subjects who understood and who also used the strategy in question.

(iv) The use of representational picture cards entailed technical as well as motivational advantages. Observations in a pilot study indicated that many children regarded picture cards as more enjoyable, more "grown-up" than toy objects, and that representational cards were more effective than non-representational cards in retaining preschool children's interest in the experiment.

(v) The nine cards were sufficiently complex to effectively study the child's concept organization and capacity for criterion shifts, yet the use of 9 items rather than the larger number employed in earlier research (33 in Reichard, Schneider & Rapaport, 1944) reduced the demands on attention and memory, which was clearly advantageous in dealing with such young subjects.

(vi) A schematic representational material, such as that used in the present study offers possibilities for further variation and elaboration of representational as well as figural elements. Thus it might be possible to vary the representational elements in order to study "concept conservation", e.g. what is most important for "house-ness", the presence of a door, a chimney or a window? When does a house cease to be a 'house'? Or, as put into words by Elkind, does a car lose its "car-ness" with the removal of the wheels or the motor (1969, p 181)?

Materials

Cards were constructed, rather similar to the pictures used by Bearison & Sigel. The dimensions used are the same (colour, form, meaning). The category instances differed from those of Bearison & Sigel, category instances with specific meanings being preferred for the purpose of the present study. A picture card in

the category 'house' should, for instance, be encodable as +villa, +castle, +apartment house. The categories chosen for the present investigation were 'house', 'animal' and 'person', since these categories are well suited for schematic representations with specific meanings.

The cards were designed in such a way that a standardlogical sorting based on any of the three dimensions ruled out the possibility of any other simultaneous sorting. Each dimension thus represented a strategy, which gave a logically consistent and exhaustive description of the material. Two sets of nine plastic coated cards, 10.3 x 7.3 cm, were constructed. The drawings were black line-drawings around center shapes in coloured paper. The sides of the angular shapes and the diameter of the circle measured 2 cm (Figure 2 and 3).

The quantitative analysis in the present report will refer only to set A. Set B is to be primarily regarded as a parallel form to be used in future research.

The two decks were designed to activate different sectors of the children's imagination. The pistol in deck B (Figure 3) could, for instance, serve as a point of departure for aggressive themes, while there were no such elements in deck A. Nonetheless, this difference between A and B apparently did not affect the formal aspect of the children's sortings to any significant degree (Table 1). Subjects who consistently used standardlogical strategies tended to do so with both sets of cards.

Table 1. Number of subjects relying exclusively on standardlogical strategies and stimulus material (A and B).

Deck A	Deck B		N 120
	-	+	
+	9	37	
-	64	10	

$$\chi^2_c = 50.5468 \quad C = .5444 (\text{contingency coeff., max.} = .707) \quad df=1 \quad p < .001$$

Neither were there any significant differences in the distribution of the different types of standardlogical strategies between deck A

and B (Table 2).

Table 2. Number of subjects producing sortings based on colour, form and meaning.

Cards	Colour	Form	Meaning	N 120
Deck A	68	49	29	
Deck B	59	47	27	

Despite the greater number of male attributes in deck B, boys and girls responded in a noticeably similar way on trial A, as well as on trial B.

Instructions

Deck A was presented before deck B. The experimenter spread the cards on a table in random order, the same on each sorting occasion (Figure 2 and 3). The child was asked to sort the cards:

These cards are put together in no real order. Now, take the ones that go together and put them in piles. You put those which belong together in one way in one pile, and those which belong together in a different way in a different pile. Take the ones that go together and put them together. You may decide yourself how many cards you want in each pile/row.
Do you understand?

The experimenter then encouraged the child to resort the cards:
Now I put the cards back as they were to begin with. Look at them again and try to figure out whether they could be arranged in some other way as well.

After each sorting, the experimenter asked:

In what way are they alike?/Why do they belong together?

If the subject offered an egological verbal explanation to an exhaustive and logically consistent sorting, the experimenter asked:

Are they alike in some other way as well?

If the subject put a card aside, the experimenter asked:

Shouldn't this one go with the other ones?

If the subject stated that the cards could not be sorted in more than one way, the experimenter did not urge him to produce more sortings. If the subject did produce a second sorting, he was offered a third sorting occasion, with the same instruction as before. Each subject was finally asked to identify the experimenter's sorting strategies. The experimenter, by turns, sorted deck A according to colour, form and meaning:

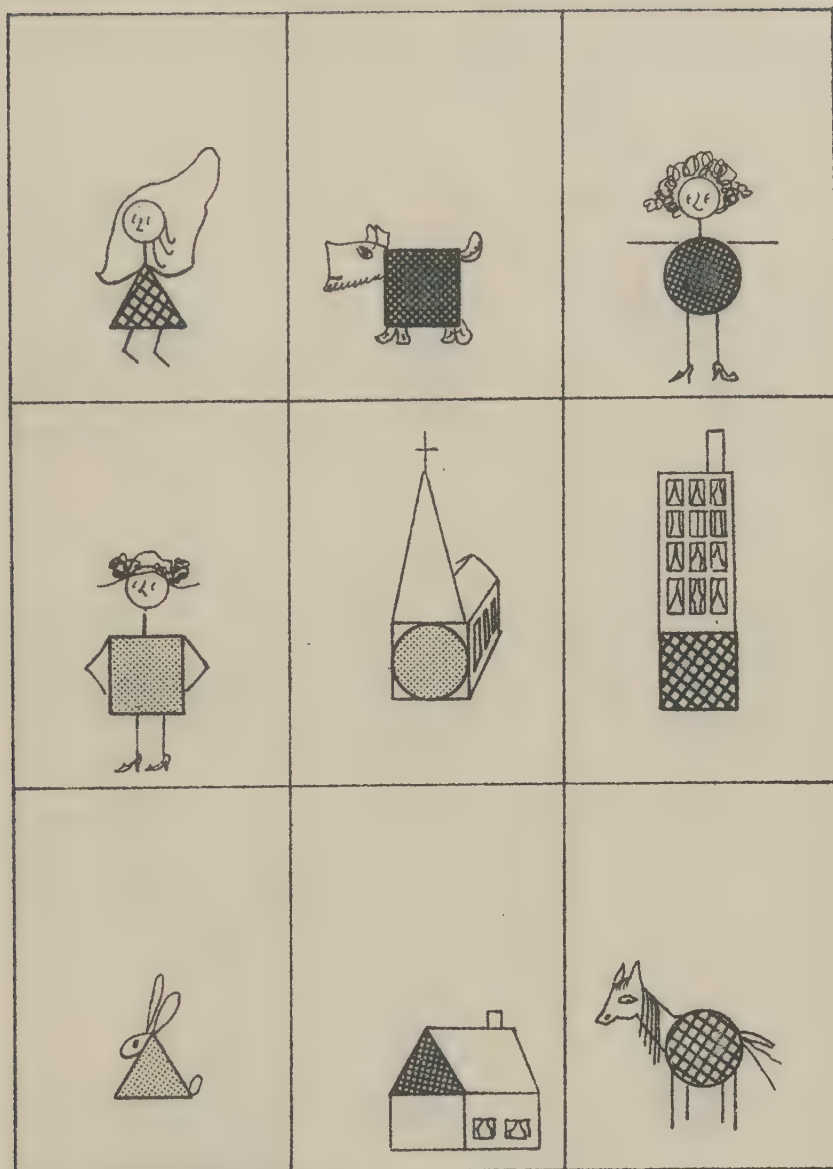


Figure 2. Deck A
Scale 1 : 2

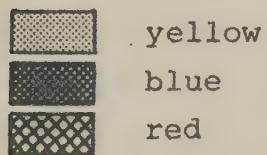
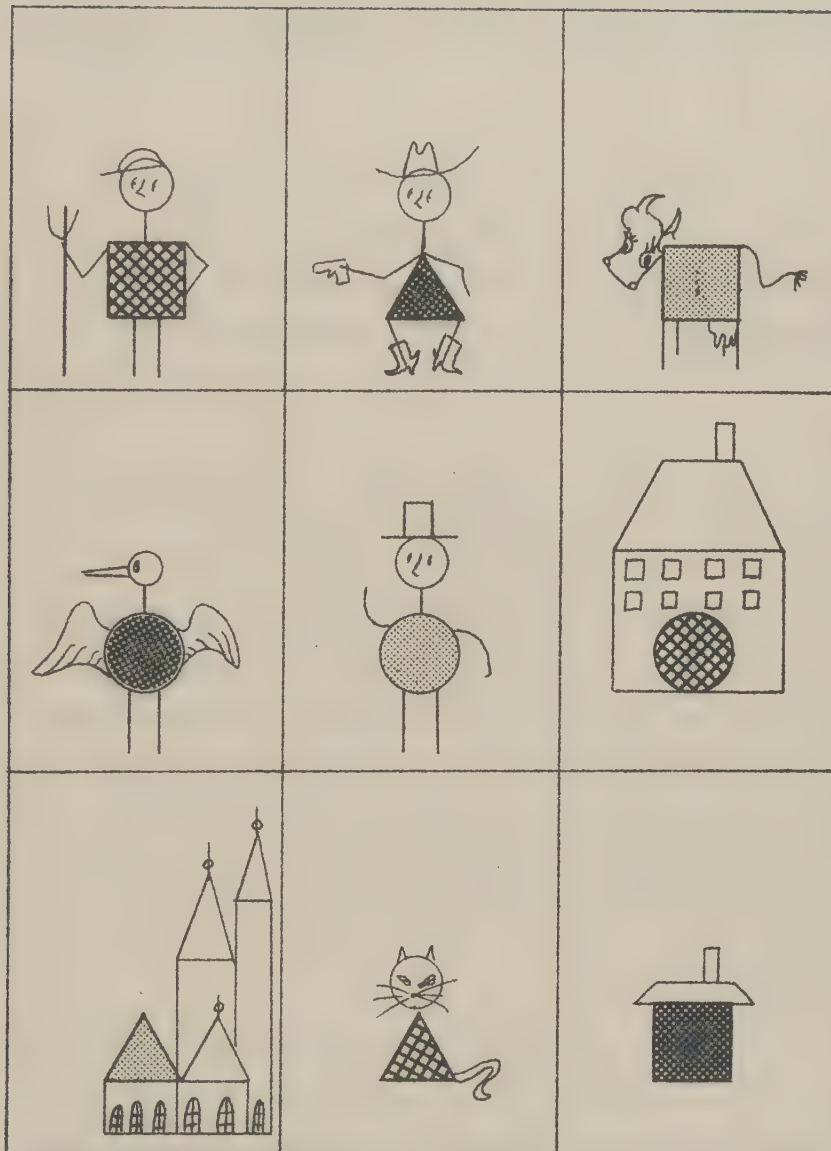


Figure 3. Deck B
Scale 1 : 2

Now I will put the pictures in order. Do these go together (E pointed at each category grouping)? Why have I put the cards in this way, do you think?/Why do they belong together?

Scoring

There were, at the most, six sorting occasions, A:1-3 and B:1-3. All the children utilized occasions A:1 and B:1. On each occasion, the cards could be divided into two or more groups. The codings were based on the transcriptions of the groupings and on the child's definitions.

The subject's division of the nine cards into two or more groups was defined as his sorting. Each sorting was either egological or standardlogical. There was, by definition, no third type. The sorting was coded as standardlogical when all the groupings were seen to be motivated by a standardlogical strategy. In all other cases, the sorting was coded as egological. The coding grid, which follows, was constructed on the basis of a pilot investigation of 12 subjects. All deck A sortings in the present study were coded by the author and by an undergraduate student in psychology. (N=311). Agreement was quickly reached on the only case in which coding diverged.

Requirements for standardlogical coding:

- (i) All cards should be sorted into groups.
- (ii) The groupings should be defined, i.e. the subject should indicate verbally, or by gesture, why the cards belong together.
- (iii) The groups should contain all cards possible within the category and no other cards.
- (iv) The definition should refer to objective characteristics. Objectivity, in this context, may be operationally defined as a definition such that an independent person might reproduce the subject's sortings, if he were familiar with the definition given (which would, for instance, not be the case with a definition such as "the prettiest ones").

Each standardlogical strategy should be coded as to type:colour (C), form (F), or meaning (M).

<u>C</u>	The groupings are based on the colour of the center shape, e.g.	
	"red", "yellow" and "blue"	3 groups
	"red" and "not red"	2 groups
<u>F</u>	The groupings are based on the form of the center shape, e.g.	
	"triangular", "square" and "round"	3 groups
	"angular" and "round"	2 groups
<u>M</u>	The groupings are based on what the card represents, e.g.	
	"houses", "animals" and "people"	3 groups
	"alive" and "not alive"	2 groups
	"have roofs" and "do not have roofs"	2 groups

If the subject produces two sortings of the same type, e.g. two types of M sortings as listed above, the first sorting is coded M, and the next one is coded M'. There may, analogously, be C' and F'. If the subject defines his sorting in more than one way, the standardlogical one, if there is one, is the one that is scored. Childish expressions are accepted in the definitions. A sorting may for instance be coded F even if the child used the word "ball-form" for "round", or "window-form" for "square".

Any sorting not coded as standardlogical is coded as egological. The category egological covers groupings of a pseudological type as well as truly idiosyncratic groupings, as follows:

Groupings defined in terms of a common concept, like "red", but containing too many or too few concept instances. Over-inclusive as well as under-inclusive concepts are thus regarded as pseudological, e.g.

Verbalized motivation:

Cards referred to:

"They are red"

Animal, house (red person excluded)

"They have eyes"

Persons (animals excluded)

"Four-legged"

Animals (bird included)

Groupings based on differences or on diffuse or far-fetched similarities:

"His hat sticks out, and the chimney sticks out and the neck of the bird sticks out"

Person, house, animal

"That's a triangle, that's a square and that's a circle"	Person, house, animal
"They are very nice to look at"	Person, house, animal
"They are all different"	Person, house, animal-

Groupings where the subject ascribes meanings to the cards in a non-conventional way (where he makes up elaborate interpretations or stories)

"Horses love churches"	Animal, house
"The king and the queen decide what the people in the house should do"	Animal, house
"Cow and cat belong together, cause they use to chat together"	Two animals
"Her ball rolls out into the street and it stops in front of the church"	Person, house
"The cat is not allowed to stay in the house, while the mistress is cleaning the house"	House, animal
"The cat eats the bird. The cow eats the cat. Cowboy shoots the cow"	Person, animals

Results

Egological sortings

Locke, in the seventeenth century, postulated (and rejected) an impossible language in which each individual thing, each stone, each bird, and each branch, would have its own name; Funes once projected an analogous language, but discarded it because it seemed too general to him, too ambiguous. In fact, Funes remembered not only every leaf of every tree of every wood, but also every one of the times he had perceived or imagined it...

Not only was it difficult for him to comprehend that the generic symbol dog embraces so many unlike individuals of diverse size and form; it bothered him that the dog at three fourteen (seen from the side) should have the same name as the dog at three fifteen (seen from the front). (Borges, 1964, pp 93-94).

Most egological concepts were characterized by fairly narrow extension. Non-exhaustive sortings were a clear example of this, the withheld card being regarded as unique. One fourth of the preschoolers compared to only one tenth of the school children produced one or more non-exhaustive sortings. Non-exhaustive sortings thus de-

creased with age, as expected ($p < .02$). Grouping in pairs was fairly frequent in non-exhaustive sortings. The subject decided on four pairs, and then he either reluctantly added a ninth card, or he put the ninth card aside. Some children gave their motivation for why they excluded a certain card, as the boy who paired off the dog and the horse, leaving out the rabbit "He is not like anyone else. There is no hunter around".

The children thus tended to pair off the cards rather than put them in groups of three or more cards. Even when a subject did operate with more extensive groupings:

(i) he, many times, pointed out similarities in pairs.

(ii) or he kept the cards apart by enumeration "This is a girl, and this is a house, and this is an animal". The subject thus indicated that the cards actually represented unique concepts. A related phenomenon appeared in some children's "homonymization" of colour terms (see further on).

(iii) or he defined the groups in terms of complementarities, i.e. the groupings were actually based on differences rather than on similarities, each card representing a distinct concept rather than an instance of a supraordinate concept.

(iv) or he made reservations, singling out certain cards as less fit concept instances.

The formal analysis of the children's sortings thus revealed narrow concept extension and juxtaposition. The content analysis, on the other hand, suggested richness and syncretism. The children produced a multitude of egological content types, and they would also alternate between these various types within one grouping, or within one sorting occasion, ascribing two or more types of egological meaning to one single grouping. This means that the content matter of the egological sortings partially eludes quantitative analysis. For the purpose of exposition, the types observed were, however, quantified in a provisional manner (Table 3).

Table 3. Number of subjects, age and types of egological content.

Age group	Pseudo- logic	Contextual association	Difference	Conviction	Perceptual syncretism	Affect
4 years	18	14	10	8	2	3
6 years	16	16	6	10	8	1
8 years	8	4	3	1	3	0

Some comments on the egological content types (labelled for practical purposes) and on their frequencies, are to be found in what follows.

Pseudologic:

One third of the subjects produced one or more groupings based on pseudoconcepts, i.e. they applied a conventional symbol form to a group with more or fewer elements than the convention requires. All but one subject, 41 out of 42 subjects, produced under-inclusive groupings, a fact that validates Saltz's notion of the child's concepts as essentially narrow in extension. The pseudoconcepts varied amongst the children. Only a few appeared in several sortings, like "people" being applied only to grown ups or only to grown up men. One boy excluded cowboys as well, talking about "cowboys and people".

Difference and contextual association:

Several subjects stated at least one difference, i.e. they defined one or more groups by telling how the cards were different rather than how they were alike. The child seemed to know the dimension similar - dissimilar, but without any real differentiation between the two poles (cf. Vygotsky, 1962, pp 70-71). Recent psycholinguistic research indicates that the child in an early stage of development may apply the conceptual opposites of a binary dimension in an indiscriminate way, e.g. more - less, same as - different from. The child apparently grasps the critical dimension to a certain extent before he masters the constituent word concepts (Donaldson &

Balfour, 1968).

Differences underlying the groupings, in the present investigation, were frequently implicit differences. The child did not talk about differences in these cases. He preferred to talk about complementary relations, or contextual links between the stimulus cards. This contextual association was expressed in terms of cohabitation "Mom and horse live in the house", kinship "Daddy, mom and girl belong together", ownership "The old woman owns the horse, the house and the dog" or activity "The dog watches his master".

Community ideas were quite conspicuous in the children's thinking. These ideas roughly amounted to that each man should have a house, a friend and an animal. No one should be on his own. The community philosophy had an imperative touch in several cases, "The dog should have some place where to live. He should not live out of doors", "She should have an animal", "She should have a house". There was sometimes a romantic streak in the community philosophy, as when one boy paired off two person cards "When they'll get older they may get married to each other". Neither man nor animal should be excluded from the community. One subject first put the people and one house in one row and an animal and a house in a second row, but she soon changed her mind "No, let's swap them around! We have to give a man to the dog!"

The contextual approach was often accompanied by idiosyncratic interpretations of the pictures. One house was, for instance, interpreted by the child as a "horse-house", a stable, in spite of the curtains. One figure was interpreted as a vicar in spite of "his" high heels.

The subjectivity of the personal perspective was unproblematic for the younger children (the blue house was a stable). Some of

the standardlogically oriented children, on the other hand, stated explicitly that the interpretations were theirs, that they were not inherent in the experimental material. One 6-year-old, for instance, said "A farm-house, I pretend, so that it will go with the rabbit".

Some cards seemed to play a central part in the children's stories. In deck A the stories frequently revolved around the church, the rabbit, the horse, or the girl: the "prettiest" pictures according to the children's post-experimental reports.

"That dog can climb in the jungle gym (=the church tower)"

"The mother looks after the house, the cows (=the dog) and the rabbits, cause the father is dead. There we have got the farm-houses. They will go to church. The little girl is skipping"

"The rabbit could be a vicar in the church"

"The dog will bite the girl. The hare will run to its home. the girl will go to her house"

"The old woman goes to church with the animal (=the rabbit)"

"The girl is looking for her rabbit"

"The rabbit hides in its hole (S sorts out the rabbit)"

"The rabbit may leap around the people's house, and a horse could stand there as well"

"The girl has found a rabbit in the garden"

"She has caught a rabbit"

"The yellow man wonders if the rabbit hides in the church"

Groupings based on contextual association tended to go with other contextual groupings. They were often subordinate to a common theme as in the above grouping about one fatherless family (second sorting cited above).

There were hardly any aggressive themes in the A sortings, but quite a few ones in the B sortings, aggressive phantasies about dangerous birds, knives, crocodiles, theft, bank robbery and warriors. The children produced such stories with obvious delight.

"He (the cowboy) goes to the bank and says 'hand me all the money!'. The police says that he may not take the money (!)"

"A dangerous bird with a round tummy and an old man who looks at it. The tummy is so round, cause it has eaten very many little birds"

"The cowboy robs there (in the blue house), cause they are both blue"

"The cowboy had a crow to shoot, cause he had no house"

"A hunter, who has a lot of dead animals in the house, and a man who chops up the animals into small pieces. And the animals that he has shot"

"Cowboy and a dangerous bird that the cowboy wants to shoot"

"A poor farmer and a warrior who wants to kill him"

"The cowboy will shoot the bird. It flies into the house to protect itself (but somewhat scared by her own phantasies she modified) - the cowboy can't shoot and the bird can't chirp"

Conviction:

In some cases, the sorting was based on conviction. The subject expressed no need to communicate his strategy, as one boy who motivated "Because I see it". Sorting by conviction tended to go with unawareness of the existence of other sorting possibilities. The younger subjects unhesitantly declared that "There are no more ways of sorting" when unable to resort the cards. The older children, on the other hand, granted the possibility of other appropriate sorting strategies, like the 6-year-old who said "There are probably more ways. Things go round so rapidly in my head, but I don't remember more ways". In addition, the older subjects and the standardlogically oriented among the younger ones would ask if the sorting was "right". To the 4-year-olds and to the egologically oriented children, though, there were no other ways than their own way (no way but the way they could see themselves). This finding is quite consistent with Piaget's theory on cognitive egocentrism (1968a).

Perceptual syncretism:

Egological perceptual syncretism here represents more or less arbitrary exterior similarities between the pictures, e.g. between

the "curls" (the fur of the dog) and the curtains in the house. There was a certain syncretism, a fusion of heterogeneous elements in these groupings. One 6-year-old, for instance, grouped the church, the rabbit, and the red girl together because "The jumping rope, the ears, and the tower stick out". Syncretic perceptual groupings tended to co-occur with pseudoconceptual form- and colour sortings. The child took figurative aspects of the picture, as his point of departure, but in an idiosyncratic manner.

Affect:

The groupings were based on the subject's own likings or own experiences, "They are very nice to look at", "Pretty colours together", "Nice", "It's fun to skip together, mother and child". There were also a few more subtle varieties "She looks like me, and she has the same colour as my dress, and she has the same colour as my sweater". In several cases, not coded as egological, the subject expressed afterwards emotive grounds for his sortings. Several subjects told the experimenter that the cards they picked up first also were the "prettiest ones". There were also more or less direct affective overtones in many contextual groupings (cf. above).

There seemed to be affective elements in the standardlogical colour strategy, if one may judge by the reaction of many children; their eager manner of grabbing the cards "Oh! Look! Such pretty colours!" etc.

Many younger children did not know the "correct" words for some of the concepts involved. They, in exchange, would use childish or home-made expressions such as "sun-colour", "mailbox-colour", "fire-engine-colour", "arrow-like", "straight-edged", "round-edged" etc. The younger children apparently felt quite proud when they did master the "correct" terms. Some children, enthralled, pointed at the colours, even before the instruction for sorting was given "Look! Red! Look! Blue! Look! Yellow!" Only two out of forty four-year-

olds produced standardlogical form sortings. Those two children, as opposed to the majority of their peers, used the "correct" terminology. One of those 4-year-olds proudly announced "Look! There we've got squares!"

Egologic in the child's categorizations may at times go with quite adult inferences in the social field. This fact is well illustrated by an incident that occurred during the present investigation: One girl apparently did not understand the experimenter's standardlogical sortings. Neither did she operate with the standard concepts 'more' or 'as much' (the conservation experiment). When the experimenter tried to leave the nursery after playing with this girl and her friends for about an hour, she protested "Why don't you stay with us?" The experimenter explained that she was short of time. The child then answered in this vein "No ..I know..you won't be doing more things with us. You don't need us any more."

Egological versus standardlogical strategies

The shift from egologic to standardlogic was quite discrete. It was rare that the child produced standardlogical concepts in isolation, i.e. composed one standardlogical group and one or more egological groups on one and the same sorting occasion. There were only 12 such cases in all; nine preschoolers and three school children. This indicates that standardlogical concepts become integrated into standardlogical overall structures at quite an early stage. Thus, the children very rarely operated with an isolated standard concept, say 'round'. When they did use a standard concept, they would use an overall standardlogical strategy, say 'round', 'square', 'triangular'.

Practically all subjects who did produce standardlogical sortings did so both on the manipulative level, and on the level of verbal explanation. There were only five standardlogical sortings by "default", i.e. sortings which would have

been coded as standardlogical had the subject only ascribed appropriate verbal definitions to them.

Some children, roughly a dozen, had access to egological and standardlogical strategies on one and the same sorting occasion, defining the sorting first in egological terms and then in standardlogical terms or vice versa. Except for these children, most subjects seemed to be aware of only one strategy at a time; egological or standardlogical.

Most subjects did produce one or more standardlogical sortings (Table 4). The majority of the preschoolers did, however, produce egological sortings as well, or restrict themselves to egological sortings. About three quarters of the school children relied exclusively on standardlogical strategies. The choice of standardlogic seemed to be a very definite one for most of these children.

A small group of preschoolers relied on standardlogic as well but perseveration or improductivity accounted for most of these cases, i.e. the preschool children who did rely on standardlogical strategies tended to use one, and only one type of standardlogical strategy. That was especially true among the 4-year-olds, where all nine cases of standardlogical dominance were based on perseveration or improductivity, as opposed to only five out of twenty-eight cases among the 8-year-olds.

Table 4. Sorting strategy in free production and age. Egologic vs standardlogic.

Age	Exclusively egological	Egological <u>and</u> standardlogical	Exclusively standardlogical	N 120
4 years	14	17	9	40
6 years	16	15	9	40
8 years	2	10	28	40

$$x^2 = 28.302 \quad C = .436 \text{ (max .816)} \quad df = 4 \quad p < .001$$

Content analysis of standardlogical strategies

The colour strategy was the most frequent standardlogical strategy (Figure 4). The representation strategy was a non-dominant strategy in the present study. Thus, the results did not corroborate Sigel's (1954) and Bearison & Sigel's (1968) discovery of an attribute hierarchy, dominated by meaning. The present results suggest that meaning dominance is partly a function of stimulus conditions.

There was a preference for form sortings among the 8-year-olds, as was reflected in their total number of sortings, as well as in their initial sortings; form $N=21$, colour $N=9$, meaning $N=1$. There was, on the other hand, a very clear colour dominance among the 4-year-olds.

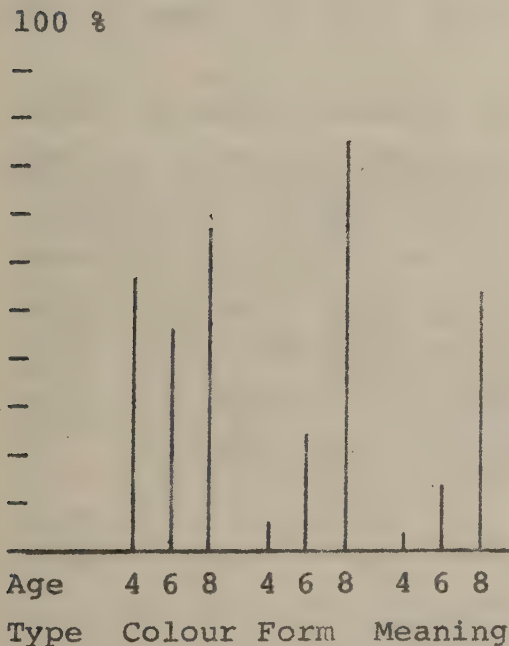


Figure 4. Subject percentages and type of standardlogical strategy, produced, in different age groups.

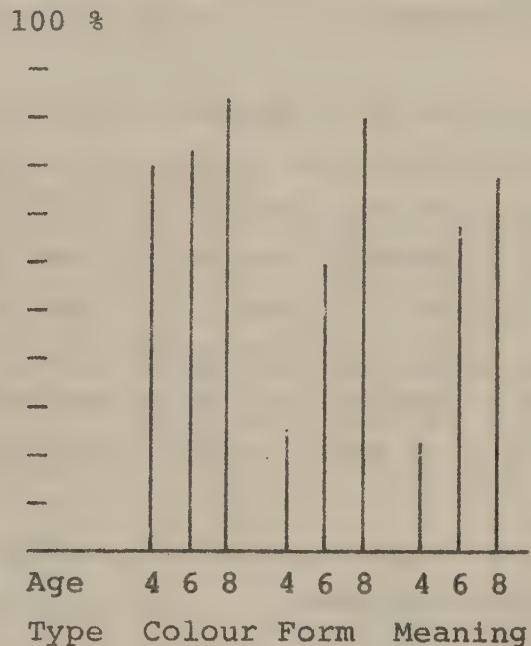


Figure 5. Subject percentages and type of standardlogical strategy, comprehended, in different age groups.

Twenty-two out of 26 four-year-olds who produced standardlogical sortings relied solely on the colour strategy. It is not

quite certain that one should regard these cases as truly standardlogical. As for the children who neither produced nor understood any standardlogical strategy except the colour strategy, it would perhaps be more justifiable to describe the results in terms of quasi-automatic sortings based on some type of concrete abstraction, where conspicuous figural properties (colour) have provoked a quasi-automatic stratification of the material (Werner, 1948, chap. 9). Certain singularities in the young children's behaviour validate the notion of such a quasi-automatic stratification. The verbalized reason for the sorting, in several cases, seemed to be an ad hoc description of the cards, an afterthought, rather than a deliberate strategy, reconstructed through introspection. A second point in case could be seen in several children's reluctant acceptance of the concept instances in their sortings, as the girl who had her reservations "The horse does not fit in an apartment-house, but the colour is red".

The children also expressed their reservations in a different, quite subtle, way by using the colour terms, as if they were homonyms "That one is red, and that one is red, and that one is red", rather than "These are red". Conversely, the spontaneous use of differentiated concepts, such as 'all', 'only', 'alike', 'the same', increased as juxtaposition decreased.

Accessibility to standardlogic across performance levels

The subject could have access to a given standardlogical strategy in an absolute sense or in a relative sense. With regard to the accessibility of a given standardlogical strategy, the results showed a sequence of the following type: Non-comprehension - comprehension - production (Table 6, 7). This sequence was statistically significant for meaning and form, but it did not hold for the colour strategy (Table 5), which can probably be explained by the 4-year-olds quasi-automatic colour sortings.

Table 5. Colour strategy, age and accessibility

Age	Non-comprehension	Comprehension but Production no production	N 120
4 years	8	9	23
6 years	7	15	18
8 years	3	10	27

$$x^2 = 5.950 \quad C = .217 \quad df = 4 \quad n.s.$$

Table 6. Form strategy, age and accessibility

Age	Non-comprehension	Comprehension but Production no production	N 120
4 years	30	8	2
6 years	17	13	10
8 years	4	2	34

$$x^2 = 63.969 \quad C = .589 \text{ (max .816)} \quad df = 4 \quad p < .001$$

Table 7. Representation strategy, age and accessibility

Age	Non-comprehension	Comprehension but Production no production	N 120
4 years	32	7	1
6 years	14	21	5
8 years	10	8	22

$$x^2 = 51.523 \quad C = .548 \text{ (max .816)} \quad df = 4 \quad p < .001$$

Labile access to either strategy was, as shown above, more common among the 6-year-olds than among younger or older subjects.

Cases of labile, or relative, access to a given strategy, i.e. access on the plane of comprehension but not on the plane of

production, could be explained in two ways: as genuine inability to apply the strategy, or as disinterest in or disinclination to use the strategy. The behaviour of the 4-year-olds did not support the latter interpretation. Some 6-year-olds, on the other hand, apparently did find the standardlogical strategy trivial or uninteresting. A few subjects in this group produced only egological sortings themselves, even though they were capable of identifying all three standardlogical strategies. Six out of fifteen 6-year-olds, with mixed strategy preference, sorted egologically on the first sorting occasion, not using standardlogical strategies until the second or third occasion. One 6-year-old probably voiced the opinion of several of his peers, when he, after two consecutive egological sortings, gave up and produced a standardlogical one "now I sort colours. That's easiest, of course".

Whilst the 6-year-olds eagerly looked for new meanings and relations, themes, and hidden connections, the 8-year-olds stuck to the standardlogical aspects of the stimulus configuration (in a more or less compulsive way). The egological sortings that occurred among the 8-year-olds were of a more pseudological type, and they were rather colourless compared to the vivid egological sortings of the 6-year-olds.

The school children's easy access to standardlogical strategies was also manifest in their deliberate manner of planning. The school children preadvertised their strategies, or they offered quick and coherent reconstruction (in 95 % of their standardlogical sortings), whereas this was comparatively rare among the preschoolers (in 14 % of their standardlogical sortings). These percentages should be regarded as very approximate but they do point to quite a widespread difference between the preschoolers and the school children. The preschoolers tended to offer their verbal definitions in a piecemeal fashion, not being too worried about coordinating the verbal definition with the actual manipulation of the cards.

The rigidity-flexibility dimension

The majority of the preschoolers switched from one standardlogical strategy to another on the comprehension plane, i.e. they identified at least two types of strategies (Table 8 and 9). On the production plane, they did not, however, produce more than one type of standardlogical strategy, whereas the majority of the school children produced two types of standardlogical strategies and identified all three types.

Table 8. Age and number of standardlogical types on the production plane

Age	Number of standardlogical types			N
	1	2	3	
4 years	25	1	0	26
6 years	15	7	2	24
8 years	7	15	16	38
$\chi^2=41.339$ C=.565 df=4 p<.001				

Table 9. Age and number of standardlogical types on the comprehension plane

Age	Number of standardlogical types			N
	1	2	3	
4 years	20	12	2	34
6 years	7	12	17	36
8 years	4	6	29	39
$\chi^2=39.335$ C=.514 df=4 p<.001				

The performance of the 4-year-olds on the comprehension plane was comparable to that of the 6-year-olds on the production plane, whilst the latter's performance on the comprehension plane was comparable to that of the 8-year-olds on the production plane.

A question, which the present investigation was not designed

to answer is whether a group of older children would have attained the flexibility of the 8-year-olds on the production plane as well. If we could extrapolate from tables 8 and 9, we would obtain a distribution as seen in Table 10.

Table 10. Subject percentages, flexibility, performance plane and age.

Age	Performance plane	Number of standardlogical strategy types			N
		1	2	3	
4 years	Comprehension	59	35	6	34
6 years	Production	63	29	8	24
6 years	Comprehension	20	33	47	36
8 years	Production	18	40	42	38
8 years	Comprehension	10	15	75	39
Older	Production	(10)	(15)	(75)	0

C o n c l u s i o n s

One aim of the present investigation was to explore a technique developed for studying the child's organization of word concepts. The technique adopted has been proven useful, and the results have validated the distinction made between egologic and standardlogic; the children showing a shift of preference with age, for these forms of logic, from egological dominance, through mixed preference, to standardlogical dominance.

There are evidently more elements of play in egologic than in standardlogic. The play situation is of central importance in the development of the symbolic function (Luria & Yudovich, 1959; Piaget 1968b; Winnicott, 1971. Considering the importance of active manipulation with three-dimensional objects (Piaget & Inhelder, 1969), it seems only natural that the child would also need a long period of play and experimentation with words and word concepts. Egological strategies can thus be seen as necessary precursors of standardlogical strategies. This need not imply that

egological systems of meanings disappear with the acquisition of standardlogical modes of functioning. In line with the thinking of Werner (1957) one might expect that egologic develops into a differentiated system with creative functions, which in turn would perhaps imply that the older child is characterized not so much by standardlogical dominance as by a greater capacity to assess the requirements of different symbol situations. The role of egologic, in a person with a standardlogical orientation, is however, far from settled. Is it a system with more differentiated functions, as suggested above, or is it an atrophied system, or a non-preferred or non-available system?

This study has been primarily focused on the development of standardlogic in concept organization. One important feature of standardlogical development was to be found in the age-linked increase in accessibility to a given standardlogical strategy. This finding is of theoretical interest, as it demonstrates that there is a great distance between the child's first recognition of a given word or sets of words, and his first understanding of the word concepts when placed within a standardlogical concept organization, and an even greater distance to his first spontaneous use of these words in standardlogical strategies.

Standardlogic thus permeated the school children's thinking at greater depth. It also covered greater areas of the older children's thinking, as evidenced in their increased ability to switch between different standardlogical strategies, which in turn reflected an increase in hierarchic integration of strategies. Even the child, who basically functions egologically, may, on a given occasion, use one single standardlogical strategy, be it a highly preferred strategy, or a strategy closely tied to the stimulus configuration. Less than a third of the children did not produce any standardlogical sortings, and less than a tenth of the children did not understand any standardlogical sortings. It was thus not the capacity to operate standardlogi-

cally, in an absolute sense, that best differentiated between the different age groups but rather the capacity to switch between different standardlogical strategies. This increased flexibility differentiated between the children on the comprehension plane as well as on the production plane, which also indicates its key role in concept development.

The standardlogical orientation is characterized by a fairly high degree of predictability. In the present study, there were, for instance only three permissible types of standardlogical strategies, whereas the very looseness of egological systems of meanings makes for multitudes of new combinations. The wealth of relations in egologic is, however, not directly linked to a shared system of relations, which limits its communicative value to the I-here-now context (cf. Rommetveit, 1972). Standardlogical orientation, on the other hand, prepares for smooth and accurate communication across time, space and communicators, transcending the immediate context, extending to the more distant ends of the spatio-temporal coordinates; to the They-there-then poles. This means that standardlogic, being linked to a shared system of conventions is better adapted to most types of formal, social interaction. The standardlogical orientation could thus tentatively be conceptualized as an index of socialization within the field of language concepts.

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*Bilingual Organization of Antonyms and
Children's Classification Strategies*

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A b s t r a c t . - Investigated bilingual organization of polar words in 50 Finnish-speaking children with varying Swedish competence. The investigation is concerned with how the child operates with word concepts which he already knows to some extent, and with the processes involved in the conventionalization and stabilization of such concepts. Concepts employed were antonym pairs; e.g. UP-DOWN, THICK-THIN. The present results support earlier predictions of acquisition order, demonstrating that they also hold for second-language development. Positive terms were understood better than their negative counter-parts ($p < .005$). The first- and second-language terms were similarly organized as shown by the related order in production ($\rho = .61$) and by the error patterns. The same substitutions appeared in both languages, similarly ordered ($\rho = .83$). Relative degree of mastery was related to the child's conceptual orientation as defined by his performance on a sorting task. The subjects classified as "standard-logical" produced more correct antonyms than the subjects oriented towards context-bound meaning ("egological" group). The follow-up analysis showed that the first group had greater access to concepts mastered in comprehension than the latter. The results were interpreted as providing additional support for arguments against the speedy-acquisition hypothesis and the hypothesis that first- and second-language acquisition are radically different.

The present study is a modest attempt to explore cognitive factors in bilingual concept acquisition. Cognitive issues in bilingual development are obviously of intrinsic theoretical and practical interest. Yet, these problems have received relatively little attention in basic empirical research (cf., Christophersen, 1973; Ervin-Tripp, 1974; McLaughlin, 1977; Macnamara, 1972). There are probably several explanations of this state of affairs. For one thing, practical problems call for rapid solutions which, all things being equal, will favour research devoted to applied problems, such as the efficiency of different educational techniques. Second, research on bilingual development is costly in terms of research resources in that, at best, methodological problems tend to double, if both languages are to be studied. Third, bilingual development is inextricably entwined with the type of bicultural group membership, which poses problems of interpretation, not easily solved.

Last, but most importantly, this area of research is one where theoretical questions more than elsewhere tend to be seriously blurred by conventional wisdom. McLaughlin (1977) has provided detailed presentations of a number of such poorly supported, yet widely held, beliefs. The two hypotheses most pertinent to the present study are (1) the hypothesis that young children learn a language more quickly and easily than adults, and (2) that second-language learning involves radically different processes than does first-language learning. For the sake of reference, these hypotheses will be referred to as (1) the speedy-acquisition hypothesis, and (2) the qualitative-difference hypothesis.

The attraction of these beliefs can be explained in different ways. On the theoretical side, the speedy-acquisition hypothesis has been influenced by the biological formulations of Penfield and Lennenberg on the presumed existence of a critical period for language acquisition. However, recent work on lateralization has had some negative implications for these earlier formulations (McLaughlin, 1977). Second, the notion of children's superior language ability is based on parents' naturalistic observations when living in second-language (L2) settings with their children. Obviously, these observations may be affected by wishful thinking on the part of the parent, nourished by his limited frame-of-reference with regard to what is typical for native-like-performance. However, a more important bias, which parents share with several authors in the field, is that phonological development is equated with general language development. With regard to phonological development, there is, in fact, substantial support for the speedy-acquisition hypothesis (Asher & Garcia, 1969; McLaughlin, 1977). However, this does not justify any conclusions as to semantic or syntactic acquisition mechanisms, since language acquisition is not a uniform process. Except for the phonological data, there is

little empirical support for speedy acquisition. On the contrary, experimental research indicates that older children and adults are more proficient in certain language abilities; e.g. comprehending commands given in a new language (Asher, 1972; Asher & Price, 1967).

In addition to the false phonology-competence equation, there is a tendency to equate comprehension with production. Observations to the effect that children cope in L2 settings (make friends etc) are confounded with general language ability. It has been argued elsewhere that young children may get along quite well with very little productive L2 mastery; e.g. through the comprehension of contextual cues for meaning (Aronsson, 1978). It is hence important to differentiate between non-verbal and verbal comprehension on the one hand, and production, on the other.

One factor, thought to work against speedy acquisition in adulthood is the existence of first-language (L1) structures. According to the advocates of the qualitative-difference hypothesis, these structures interfere with L2 acquisition (by implication, older children will thus have greater difficulties than younger ones - acquire L2 less quickly). At any rate, the literature does not indicate that interference is an important mechanism in bilingual development. On the contrary, there is some experimental evidence that L2 development in certain respects reflects the acquisition order of L1. Empirical data have shown developmental errors to predominate over interference errors (Dulay & Burt, 1974). This means, for instance, that Spanish-speaking children learning English as a second language make errors typical of young English-speaking children and not errors reflecting Spanish sentence patterns; e.g. the subjects in the Dulay and Burt study made ten times as many errors of the type HE NOT EAT as errors, involving omission of pronouns such as DOESN'T EAT (this last phrase corresponds to the Spanish phrase "NO COME"). Similar studies giving evidence for qualitative similarities between L1 and L2 acquisition have con-

cerned morphology (Ervin-Tripp, 1974; Natalicio & Natalicio, 1971) word-order, and other aspects of syntax (Ervin-Tripp, 1974; Dulay & Burt, 1974; Ravem, 1976). There are apparently no such studies concerning the gradual acquisition of language concepts in bilingual children.

Language concepts and relativity of meaning

Emphasis on linguistic interference as an important mechanism in L2 concept acquisition entails the implicit assumption that there is one definite meaning for each word in each language, or phrased differently, that there are strict boundaries between different words within a given language. Recently, this assumption has been seriously challenged from different positions. These positions will here be subsumed under what will be referred to as a neo-Wittgensteinian emphasis on "concept relativity" - focus on within-language variation rather than between-language variation. (It is assumed by the present author that the notion of linguistic interference becomes less meaningful if there is considerable within-language variation).

One such line of thought has stressed the importance of interpreting meaning within a given context, regarding meaning not as a unitary phenomenon but rather as a matter of meaning potential (Rommetveit, 1974; 1976). Second, recent work has provided empirical support for Wittgenstein's notion of family resemblances (Rosch, 1973; Rosch & Mervis, 1975). Rosch made subjects judge the representativeness of various category instances. Agreement between subjects was high; for instance, most subjects judged CHEMISTRY to be "more" SCIENCE than HISTORY and an APPLE to be "more" FRUIT than a FIG. On the basis of such ratings, Rosch distinguished between prototypical instances and boundary cases within given categories, and argued against those theoretical traditions which treat category membership as an all-or-none phenomenon (Rosch, 1973; Rosch & Mervis, 1975).

Third, a related kind of relativity has to do with accessibility; i.e. the availability of a given word concept in both comprehension and production contexts (cf., Flavell, 1970). For instance, Aronsson (1975) showed that even if a given subject "knows" such terms as COLOUR, FORM, HOUSES, PEOPLE, ANIMALS, the underlying concepts do not necessarily form the basis of his classification strategies (or his understanding of these strategies when employed by others).

Obviously, not all accessibility phenomena are interesting. It is quite evident that a given 6-year-old might not fully understand the meaning of such words as ASTRONAUT or DIESEL-ENGINE, even though he might recognize the word in question and use it in appropriate contexts (e.g. MOM'S MERCEDES HAS A DIESEL-ENGINE). The fact that the same child perhaps has very vague ideas about what DIESEL refers to is not remarkable in view of his relatively limited experience of the world. In contrast, accessibility phenomena are theoretically interesting when they concern common concepts that become stabilized (more available) in some systematic order or concepts that are somehow more central and important than others in the child's conceptual development - powerful concepts in Flavell's terminology (Flavell, 1970). By this criterion, a concept is powerful if it is more intimately linked to the child's acquisition of knowledge than other concepts (e.g. a word concept such as MORE as compared to a simple word such as GARAGE).

The present investigation is concerned with one domain of powerful concepts - spatial (in the broadest sense) word concepts; i. e. terms that express properties of objects in a three-dimensional space with regard to place, shape, size or direction. Spatial terms of the type employed in the present investigation - OVER, UNDER, BEFORE, AFTER, WIDE, NARROW - are powerful in several ways. In addition to the fact that these terms form the means for communication regarding space and time, they also constitute a great proportion of the daily linguistic input, thus indirectly mediat-

ing knowledge. Moreover, these terms have great metaphorical potential as indicated by a large number of idiomatic expressions; UNDER AGE, UNDER COVER, NARROW-MINDED, NARROW ESCAPE (cf., "SMALA LYCKA", in Swedish) etc.

The complexity hypothesis

In addition, powerful concepts are good candidates for linguistic universals, assuming that languages primarily express those categories and relations that are somehow more basic and important than others. This reasoning presupposes that it is possible to formulate some kind of order of complexity between word concepts (within certain language domains), singling out the more basic or less complex concepts. Such a complexity order, if proven for bilingual development, would go against the qualitative-difference hypothesis (which posits different acquisition processes in L1 and L2).

Clark (H. Clark, 1973) has formulated a complexity hypothesis, predicting the order of acquisition for spatial terms. This model defines complexity order in terms of the child's varying difficulties in mapping basic notions of the world onto language. One determinant of difficulty is man's biological perceptual apparatus. The ordinary upright position - the canonical position - defines what is cognitively more natural and what is less natural, more complex (cf., Figure 1). Thus, when a person stands, the space in front of him, above the ground, is optimal for perception by eye, ear and touch (Clark & Clark, 1977). Upward and forward are thus natural directions relative to downward and backward. For instance, the term UP will thus be acquired before DOWN. Clark maintains that what is natural is also indicated by linguistic polarity conventions. On the basis of linguistic theory (c.f., Bierwisch, 1967; Greenberg, 1966), Clark maintains that antonym pairs such as LONG-SHORT, WIDE-NARROW can be differentiated in terms of positive/nega-

tive polarity and that the positive pole member is the most "natural" or easiest one, whereas the negative member is the more complex one. For certain word pairs, these distinctions can be formulated in terms of markedness; the positive member is then the unmarked one and the negative member the marked one. Semantic markedness conventions spell out category ascription. One such convention is that, if a given term has the same morphemes as a related term plus one or more extra morphemes, the lengthier word is the marked one (e.g. the expression HOUSES is more complex than HOUSE, JUMPED more complex than JUMP, UNHAPPY more complex than HAPPY). Another convention says that the name of the dimension indicates which term is the unmarked one; e.g. LENGTH comes from LONG-SHORT, HEIGHT from HIGH-LOW. Also, unmarked terms can have a neutral interpretation; e.g. the unmarked expression ACTOR may refer to a male or female person whereas ACTRESS cannot be neutralized. Within a given antonym pair, the positive member will be acquired first.

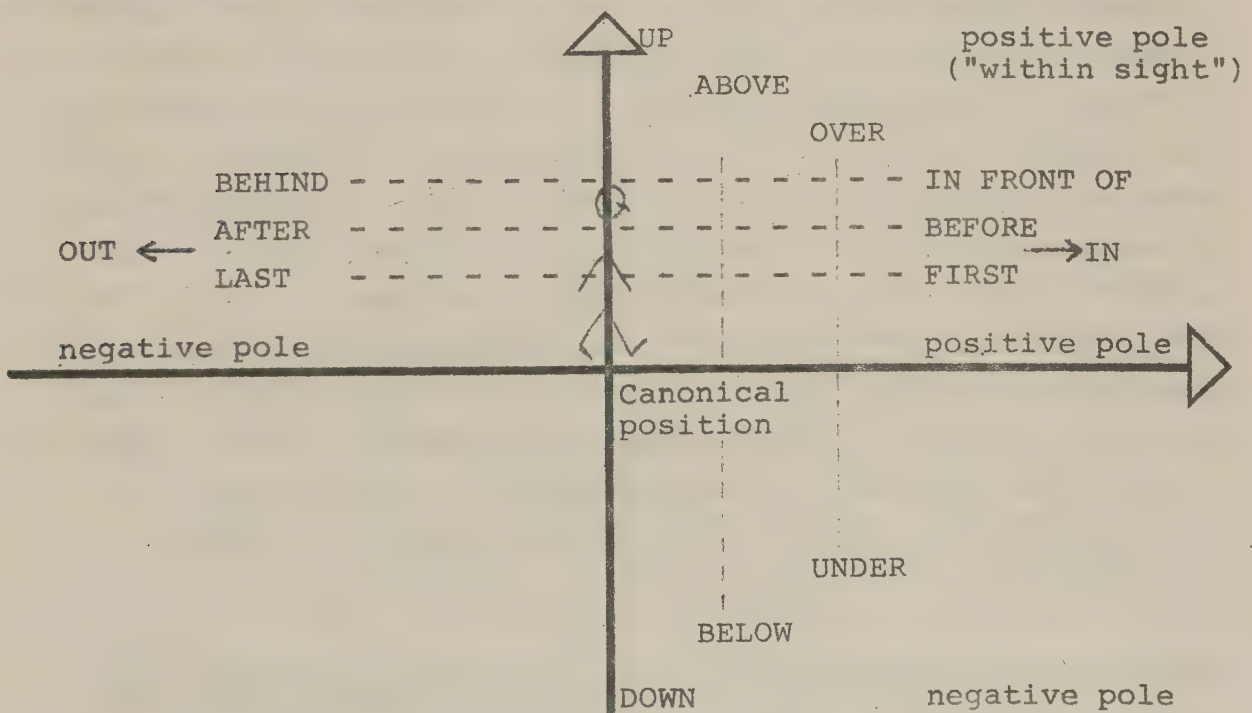


Figure 1. Polarity of some common adjectives and adverbs within the frame-work of the canonical position (c.f., Clark, 1973).

Clark (E. Clark, 1973) has formulated the semantic feature hypothesis, a complementary one to the complexity hypothesis. The semantic feature hypothesis posits that the meaning of words is made up of features or components of meaning and that children learn word meanings gradually by adding more and more features. For instance, the child can be said to acquire the concept "brother" feature by feature, as follows: at the first stage he construes the concept as [+Male; -Adult] and then at a later stage as [+Male; ±Adult; +Sibling] until he finally arrives at the standard concept [+Male; ±Adult; +Sibling; +Reciprocal] (cf., E. Clark, 1973).

There are several empirical studies supporting the complexity hypothesis with regard to order of acquisition in English (Bartlett, 1976; Brewer & Stone, 1975; E. Clark, 1972; Wales & Campbell, 1974). There is also some German performance evidence (Grimm, 1975). The investigation most pertinent in the present context is the one conducted by Clark (1972). She studied the order of difficulty of eighteen polar pairs as reflected in 4- and 5-year-old children's success in producing appropriate antonyms in a "word-game". The present study will, in part, replicate Clark. However, the present study also involves a second-language, since it is designed to answer questions concerning bilingual concept acquisition. Clark's study serves as a useful point of departure in that it provides English comparison norms. Obviously, the complexity hypothesis will be considerably strengthened if Clark's (1972) predictions also hold for Swedish, on the one hand, and Finnish, on the other.

Child-generated systems of meaning and bilingual organization

The complexity hypothesis may predict order of acquisition - other explanations are needed to cover differential rates of acquisition.

It is here assumed that the rate of acquisition is quite slow or, at least, that basic spatial concepts, of the type employed by Clark (1972) become integrated in a step-by-step fashion; i.e. that it takes quite some time before these concepts are readily available for use on any given occasion. Within the framework of this study as well as the earlier one (Aronsson, 1975), two interrelated factors are assumed to be operative in delaying conventionalization of common spatial concepts; insufficient experience of the world, on the one hand, and type of conceptual orientation, on the other. With regard to experience of the world, age is an obvious, even if somewhat crude, index. Conceptual orientation has earlier been operationalized in terms of children's classification strategies in a sorting task (Aronsson, 1975). Standard-logical orientation was there defined as the subject's ability to identify three logical criteria (colour, form and meaning) which each gave an exhaustive and logically consistent description of the material to be sorted. All concepts involved were well-known and, in contrast to many other classification studies, the limited material (nine cards) was quite easy for the child to handle. Yet, only the oldest subjects (8-year-olds) were able to switch freely between the three different possible standard-logical strategies (Aronsson, 1975). The preschool subjects failed to produce more than one or two such strategies, which is of interest in view of their familiarity with the word concepts involved and in view of the simplicity of the material. Moreover, these younger subjects were unable to adopt the experimenter's perspective (to understand the criterion shifts produced) which was regarded as indicative of the presence of ego-logical, or child-generated, systems of meaning (context-dependent classification systems based on personal experience and on the subjective point of view). Within the context of the present investigation, the child-generated system of meaning can be regarded as a system that interferes with standard concepts in L1, on the one hand, and standard concepts in L2, on the other (Figure 2).

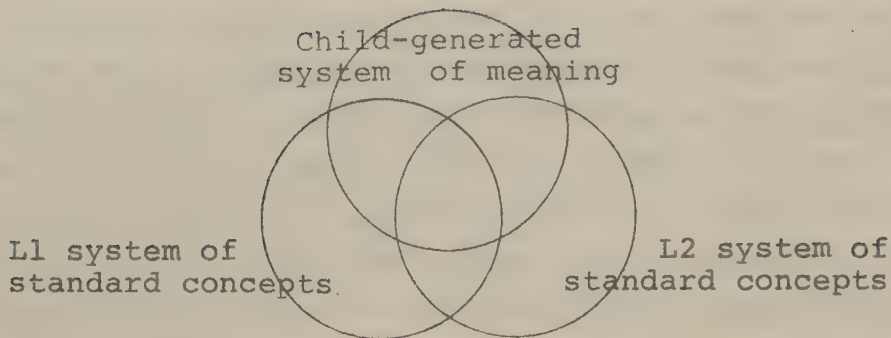


Figure 2. Interaction between L1 and L2 standard concepts and child-generated systems of meaning.

Child-generated systems of meaning will permeate both L1 and L2 - there will thus be similar errors in both languages. The errors will be similar even if the number of concepts mastered is not the same for the two languages (since similarity of errors is predicted on account of the complexity hypothesis). In the present case, types of errors can be inferred from the egocentric perspective; i.e. those categorizations which are more "natural" from the point of view of the canonical position will be the predominant ones (cf., Figure 1). The stronger the position of child-generated systems of meaning, the greater should be the intrusion on the L1 and L2 systems of standard concepts; i.e. there will be less correct mastery and more partial comprehension and errors.

To summarize, a number of hypotheses have been raised in the preceding. It has been postulated that common spatial concepts will be acquired gradually. Order of acquisition will primarily reflect the relative cognitive-semantic complexity of spatial terms and not language unique surface features. L2 order will thus be similar to L1 order (which goes against the qualitative-difference hypothesis). Complexity can be formulated in terms of polarity and relative position within the given domain. Age, on the one hand, and conceptual orientation, on the other, will determine rate of stabilization.

Method

Subjects

The subjects were fifty immigrant children of Finnish extraction; thirty 6-year-olds and twenty 8-year-olds. The median age for each of the two groups was 6:9 and 8:9 (at the outset of the present series of experiments). There was an approximately even distribution of boys and girls; 16 and 14, respectively, among the younger subjects and 9 and 11 in the older group. All subjects were enrolled in a bilingual-bicultural educational program in the Rosengård area of the city of Malmö (for a presentation of the whole program, see Johannesson, 1975). Most Finnish-speaking parents in the area had chosen to enroll their children in this cost-free bilingual program, which means that program enrolment as such does not involve any known selection factors. Rosengård, a recently-built suburban complex, is characterized by a quite high turn-over of residents, including many immigrant groups. Socio-economically, the subjects of the present investigation constitute a quite homogeneous group, the majority of their fathers being skilled workers (e.g. welders and fitters). There were only two children with parents who have a formal education at or above "student-examen" (A-levels). More than 80% of the children were born in Sweden or immigrated during their first two years of life. This holds true also for each of the subgroups (6- versus 8-year-olds; egological versus standard-logical subjects). Finnish is the first language of these children in the sense that they have all been exposed to Finnish since birth, whereas Swedish has been introduced at some later stage (usually when the children have been old enough to play outside on their own). Such a chronological definition is of course not the only possible type of L1-L2 distinction, yet the most reasonable one for the present purpose (cf., Christophersen, 1973).

The bilingual-bicultural program involves children of four different age-strata. For the purpose of the present investigation, the two oldest groups were pooled into one group (the 8-year-

olds) and the two youngest groups into one group (the 6-year-olds). It was necessary to combine two consecutive years of testing in order to obtain adequately sized groups for statistical analysis and comparison. The fifty subjects of the present study constitute all children enrolled in the program at the time of the testing.

Procedure

Each subject was examined individually, on three separate occasions. The Swedish version of the antonym experiment was conducted 3-5 weeks before the Finnish version. The sorting experiment was conducted in between. The first antonym experiment was administered in Swedish by one experimenter (the author), while the other two experimental sessions were conducted in Finnish by a native-speaking psychologist (Pirjo Ouvinen-Birgerstam).

The Antonym experiment

Comprehension task: (first task)

For each language version, the material consisted of 120 coloured pictures (30 items $\times$ 4 pictures), constructed specifically for the present study. The pictures were created in such a way that 30 pictures illustrated the target concepts; each correct picture matched by three distractors representing contrasting concepts (one picture representing the opposite of the concept). The 4 $\times$ 3 cm pictures were arranged in rows (A-D). The pictures represented familiar elements such as cats, dogs, and tables. Each item contained only one type of motif. The four pictures included varied only as to the relative configuration of the elements. The position of the appropriate picture (A/B/C/D) was balanced and item order was randomized within each language version. The target concepts were embedded in phrases, e.g. "The WIDEST street" or "The boy steps OUT" (Table 1). The child was asked to point to the appropriate picture, for each item.

Table 1. Antonym experiment. Phrases used in the comprehension task.
Translation equivalents in literal English.

Pair	Language version	
(The pair member to the left =positive pole)	The stimulus phrase is presented in capital letters (target word, underlined), whereas the English translation equivalent is presented in lower case letters.	
	Swedish	Finnish
BIG-SMALL ^a	DEN <u>STÖRSTA</u> HUNDEN The biggest dog POJKEN HAR <u>MINST</u> MAT The boy has least food	SUURIN AUTO The biggest car POJALLA ON <u>VÄHITEN</u> VAATTEITA The boy has least clothes
LONG-SHORT ^b	DEN <u>LÄNGSTA</u> POJKEN The tallest boy DEN <u>KORTASTE</u> POJKEN The shortest boy	PISIN KÄÄRME The longest serpent LYHYIN KÄÄRME The shortest serpent
HIGH-LOW	DEN <u>HÖGSTA</u> LAMPAN The highest (floor-)lamp DET <u>LÄGSTA</u> HUSET The lowest house	KORKEIN TUOLI The highest chair MATALIN PÖYTÄ The lowest table
WIDE-NARROW ^c	DET <u>BREDASTE</u> BORDET The widest table DET <u>SMALASTE</u> BORDET The most narrow table	LEVEIN KATU The widest street KAPEIN KATU The most narrow street
THICK-THIN ^d	DEN <u>TJOCKASTE</u> BOKEN The thickest book DEN <u>TUNNASTE</u> BOKEN The thinnest book	PAKSUIN TAKKI The thickest jacket OUHIN TAKKI The thinnest jacket
DEEP-SHALLOW ^e	DEN <u>DJUPASTE</u> HÄLAN The deepest cavern DEN <u>GRUNDASTE</u> HÄLAN The most shallow cavern	SYVIN VESI The deepest water MATALIN VESI The lowest water
MORE-LESS	POJKEN HAR <u>MER</u> MAT ÄN FLICKAN The boy has more food than the girl POJKEN HAR <u>MINDRE</u> MAT ÄN FLICKAN ...less food...	POJALLA ON <u>ENEMMÄN</u> VAATTEITA KUIN TYTÖLLÄ The boy has more clothes than the girl POJALLA ON <u>VÄHEMMÄN</u> VAATTEITA KUIN TYTÖLLÄ
IN-OUT	HAN GÅR <u>IN</u> He steps in FLICKAN GÅR <u>UT</u> The girl steps out	KOIRA MENE <u>SISÄN</u> The dog steps in KISSA MENE <u>ULOS</u> The cat steps out
UP-DOWN	KATTEN GÅR <u>UPP</u> The cat steps up HAN GÅR <u>NER</u> He steps down	TYTTÖ MENE <u>YLÖS</u> The girl steps up TYTTÖ MENE <u>ALAS</u> The girls steps down

Swedish	Finnish
BEFORE ^f AFTER	NORSU KULKEEE TÄDIN <u>EDELLÄ</u> The elephant walks before the lady
KATTEN GÅR <u>FÖRE</u> HÄSTEN The cat walks before the horse	TÄTI MENEE PALLON <u>PERÄSSÄ</u> The lady walks after the ball
POJKEN GÅR <u>EFTER</u> FLICKAN The boy walks after the girl	
FIRST-LAST ^g	TYTTÖ KÄVELEE <u>ENSIMMÄISENÄ</u> The girl walks first
KATTEN GÅR <u>FÖRST</u> The cat walks first	MIES KULKEE <u>VIIMEISENÄ</u> The man walks last
ELEFANTEN GÅR <u>SIST</u> The elephant walks last	
ABOVE-BELOW	PALLO ON TUOLIN <u>YLÄPUOLELLA</u> The ball is above the chair
HUNDEN ÄR <u>OVANFÖR</u> BORDET The dog is above the table	PALLO ON TUOLIN <u>ALAPUOLELLA</u> The ball is below the chair
KATTEN ÄR <u>NEDANFÖR</u> BORDET The cat is below the table	
OVER-UNDER	KÄSI ON PÖYDÄN <u>YLLÄ</u> The arm is over the table
FÄGELN ÄR <u>ÖVER</u> BORDET The bird is over the table	KÄSI ON PÖYDÄN <u>ALLA</u> The arm is under the table
KATTEN ÄR <u>UNDER</u> BORDET The cat is under the table	
IN FRONT OF- BEHIND	KISSA ON NORSUN <u>EDESSÄ</u> The cat is in front of the elephant
FÄGELN ÄR <u>FRAMFÖR</u> KATTEN The bird is in front of the cat	MIES ON HEVOSEN <u>TAKANA</u> The man is behind the horse
HUNDEN ÄR <u>BAKOM</u> HÄSTEN The dog is behind the horse	
SIMILAR- DIFFERENT	SAMANLAISET VAATTEET Similar clothes
LIKADANA BLOMMOR Similar flowers	ERILAISET VAATTEET different clothes
OLIKA BLOMMOR Different flowers	

^aThere is only one expression for SMALLEST and LEAST in Swedish ("MINST"), whereas this distinction is manifested in Finnish ("PIENIN"/"VÄHITEN"). The LEAST-alternative was chosen to make possible a comparison between subjects' mastery of LESS and LEAST.

^bThe LONG/TALL distinction is not represented either in Swedish or Finnish.

^cThe Swedish equivalent for NARROW ("SMAL") stands for 'narrow' and 'lean'. The NARROW/LEAN distinction is, however, always expressed in Finnish ("KAPEA"/"LAIHA").

^dBoth languages have two opposites for THICK: Swedish -"SMAL" ('lean', 'narrow') and "TUNN" ('thin'), Finnish -"LAIHA" ('lean') and "OHUT" ('thin').

^eThe SHALLOW/LOW distinction is represented in Swedish ("GRUND"/"LÅG") but not in Finnish: ("MATALA"/"MATALA").

^fThere is only Swedish expression for AFTER ("EFTER"). In Finnish, though, there are more expressions; "PERÄSSÄ", "JÄLJESSÄ", "PERÄSTÄ", "JÄLJESTÄ", "JÄLKEEN".

^gThe Swedish target words are covered by several expressions in Finnish: "FÖRST" by "ENSIN", "ENSIMMÄINEN", "ENSIMMÄISENÄ" and "ENSIMMÄISEKSI"; "SIST" by "VIIMEINEN", "VIIMEISENÄ" and "VIIMEISEKSI".

Production task: (second task)

The subject was told by the experimenter that he was going to play a word game, and was then asked if he knew what an opposite was. The experimenter then gave the child a few examples, as follows: "This is an opposite-game. I say a word, and then you say the opposite. If I say HOT, then you say.... COLD. So if I say BOY, you say.... GIRL." (cf., Clark, 1972). The subject was then given the Swedish/Finnish translation equivalents of the stimulus words (randomly ordered), as follows: IN, BIG, EARLY, UP, OLD, BEFORE, LONG, MORE, HIGH, ABOVE, WIDE, OVER, IN FRONT OF, SIMILAR, THICK, DEEP, FIRST, and MOST (see Table 1 for the Swedish and Finnish stimulus words except for the adjectives which were presented in their superlative form in the comprehension task for the sake of objective pictorial representation). The experimenter made no corrections during the task. "Don't know" responses were not given second attempts. Opposites of the same word-class as the stimulus word were scored as correct. Adjective opposites were only scored as correct if they belonged to the appropriate comparison form (e.g. MORE-LESS but not MORE-LEAST was scored as correct) (cf., Table 6). All analyses are based on those 15 words that also appear in both language versions of the comprehension task. The extra three words were included in case they might provide additional information of interest and because they were part of Clark's original investigation (1972).

The sorting experiment

Material:

The sorting material consisted of 9 picture cards, constructed to fit a priori standard-logical classifications; classifications that give exhaustive and logically consistent descriptions of the material (for details, see Aronsson, 1975). The set of cards could be sorted according to three such strategies: colour ('red', 'yellow' and 'blue'), form ('round', 'triangular', and 'square'), and meaning ('house', 'animal', and 'person'). The cards were designed

in such a way that a standard-logical sorting based on any of the three dimensions ruled out the possibility of any other simultaneous standard-logical sorting. The cards were plastic coated cards, 10.3×7.3 cm, with black-line drawings around center shapes in coloured paper. The sorting material is pictorially simple and yet it is sufficiently complex to generate different strategies (see Figure 2, Aronsson, 1975).

To start with, the experimenter spread the cards on a table in random order, the same on each sorting occasion (see also, Aronsson, 1975). The child was asked to "put the ones together that belong together". The experimenter then encouraged the child to re-sort the cards. The subjects were offered up to three sorting occasions. After each sorting, the experimenter asked for a motivation. Each subject was finally asked to identify the experimenter's sorting strategies. The experimenter, by turns, sorted the cards according to colour, form and meaning (excluding the strategy/strategies which the subject had already utilized himself). In addition to the standard-logical sortings, the experimenter also presented the child with two egological sortings. The analysis of the subject's responses to these sortings was, however, not intended to be a part of the present investigation.

Scoring:

On each sorting occasion, the cards could have been divided into two or more groups. The coding of these sortings, for purpose of analysis, was based on the groupings and on the explanations given. The subject's division of the nine cards into two or more groups was defined as his sorting. Each sorting was defined either as egological or as standard-logical. The sorting was coded as standard-logical when all the groupings were seen to be motivated by a standard-logical strategy.

Requirements for standard-logical coding:

- (i) All cards should be sorted into groups.
- (ii) The groupings should be defined, i.e. the subject should indicate verbally, or by gesture, why the cards belong together.
- (iii) The groups should contain all cards possible within the category and no other cards.
- (iv) The definition should refer to objective characteristics. Objectivity in this context, may be operationally defined as a definition which would enable someone who has not seen the actual groupings to reproduce the subject's sorting (which would, for instance, not be the case with a definition such as "The prettiest ones" or "They live together").

Each standard-logical strategy was coded as to type: colour-, form- or meaning, e.g.:

Colour	Groupings based on the colour of the center shape:	
	"red" "yellow" "blue"	3 groups
Form	"red" "not red"	2 groups
	Groupings based on the form of the center shape:	
Meaning	"triangular" "square" "round"	3 groups
	"angular" "round"	2 groups
Childish expressions were accepted in the definitions, e.g. BALL-FORM for 'round' or SUN-COLOUR for 'yellow'. Any sorting <u>not</u> coded as standard-logical was coded as egological. This category covers groupings of a pseudological type as well as truly idiosyncratic groupings, e.g.:	Groupings based on what the cards represent:	
	"houses" "animals" "people"	3 groups
	"they have roofs" "they don't have roofs"	2 groups

Verbal definition:

THEY ARE RED

THEY HAVE EYES

THEY ARE ALL DIFFERENT

HER BALL ROLLS OUT INTO THE STREET

AND IT STOPS IN FRONT OF THE CHURCH

HORSE AND CHURCH BELONG TOGETHER,

CAUSE HORSES LOVE CHURCHES

Cards referred to:

Animal, house (red person excluded)

Persons (animals excluded)

Persons, house, animal

Person, house

Animal, house

Coding of conceptual orientation:

The subjects who produced (or identified) all the three types of standard-logical criteria were classified as standard-logically oriented. In the present investigation, 14 of the younger subjects were thus classified as standard-logically oriented and 16

as egologically oriented. The corresponding figures for the older group were: 14 standard-logical and 6 egological subjects.

Results and comments

Complexity - comprehension, production

All analyses, in the following, are based on word pair units. Results are analyzed in terms of comprehension (both pair members), partial comprehension (positive/negative member) and no comprehension.

The polarity aspect was examined in two ways: first, an item-by-item significance analysis was performed on the positive/negative dominance pattern (Table 2). There was 1 substantial difference in the opposite direction to the one expected (BEFORE-AFTER in Finnish. However, 9 out of 26 differences went in the predicted direction and were statistically significant according to the binomial test. Further, 11 more differences showed the expected trend. Second, the overall pattern was inspected without any regard to the size of differences found. More than 3/4 of the differences were in the predicted direction; a trend which was highly significant ($p < .005$, sign test).

As previously indicated, the advantage of positive over negative is quite well established with regard to English (and German) performance data. As known, such empirical acquisition data have not been obtained either for other Indo-European languages or for languages from other language families. The present support for the polarity aspect of the complexity hypothesis would thus have been interesting in its own right even if it had concerned only one language other than English. Two additional features add weight to the present results. First, the similar patterns concern two radically different languages; one Finno-Ugric and one Indo European. Surface fea-

tures such as word length, phonological complexity etc vary considerably between the respective word pairs (cf., Table 1). Second, it is not obvious that L2 patterns should agree with L1 patterns. An alternative prediction would have been that newly acquired L1 structures appear about the same time in L2 (thus preceding early L1 structures). As can be seen, this is not the case. The intimate relation between L1 and L2 acquisition is also reflected in the association between order of difficulty for the Swedish and Finnish antonyms (Table 3). The rank order correlation ($\rho = .61$) is a moderate one. However, (if one does not subscribe to the complexity hypothesis) there is no a priori reason to assume any ordered complexity whatsoever. The age groups concerned are well past the stage of initial language acquisition. Also, all the word pairs involve everyday concepts (well known or at least partly known). The rank order association thus reflects a quite subtle organization. Further, as pointed out, the two languages are quite different. For instance, there are less surface feature similarities between Swedish and Finnish than between Swedish and English (as can be inferred from Table 1).

Table 3 shows that certain oppositions are much easier (relatively speaking) in Finnish than Swedish; e.g. SIMILAR-DIFFERENT, IN FRONT OF-BEHIND and DEEP-SHALLOW. As for the latter pair, it has already been demonstrated that SHALLOW is more simple in Finnish than Swedish in that there is but one global word ("MATALA") for 'shallow' and 'low'. Similar arguments can be raised concerning BEHIND as the Finnish term ("TAKANA") is a more global one than the Swedish equivalent which has to be differentiated from the related terms "BAK", "BAKÅT", "BAKTILL", "BORTOM" (whereas there are fewer related expressions in Finnish - "TAKAPUOLI", "TAAKSE").

Table 2. Polarity pattern, by word pairs, and by language version. Comprehension.

Word pair	Number of subjects who have mastered only one pair member (positive/negative pole of dimension)							
	Swedish version		Finnish version					
	Positive only	Negative only	Sign ^a	Binomial test p (one- tailed)	Positive only	Negative only	Sign	Binomial test p (one- tailed)
BIG-small	11	2	+	<.011	3	1	+	
LONG-short	5	3	+		3	1	+	
HIGH-low	22	1	+	<.001	3	0	+	
WIDE-narrow	6	12	-		12	4	+	<.038
THICK-thin	15	0	+	<.004	2	0	+	
DEEP-shallow	37	1	+	<.001	1	2	-	
MORE-less	6	1	+		1	5	-	
IN-out	7	6	+		0	0	0	
UP-down	3	0	+		2	0	+	
BEFORE-after	1	1	0		4	14	-	(<.030) ^b
FIRST-last	1	3	-		3	3	0	
ABOVE-below ^c	14	4	+	<.015	6	0	+	<.016
OVER-under	2	4	-		0	0	0	
IN FRONT OF-behind	21	4	+	<.002	7	0	+	<.008
SIMILAR-different	6	2	+		3	2	+	

^a Difference in direction predicted by the complexity hypothesis: +
Difference in reverse direction: - ; ties: 0

^b Difference in the opposite direction to expectation; two-tailed test

^c Figures refer to a liberal scoring of this and the following item ('not below'-responses accepted for ABOVE and 'not under'-responses for OVER) which was done in order to compensate for asymmetrical difficulties of the positive/negative distractors.

Sign test; $z = 2.55$, $N = 26$, $x = 6$.; one-tailed $p < .005$

Table 3. Complexity as reflected in word pairs mastered, ranked by language. Production task.

Pair ^a	Word pairs, ranked according to the number of correct responses for each language version	
	Swedish ranks	Finnish ranks
IN-out	1	1
THICK-thin	2	4
UP-down	3	2
BIG-small	4	3
FIRST-last	5	13
ABOVE-below	7	5.5
OVER-under	7	7.5
LONG-short	7	10
WIDE-narrow	9	14
MORE-less	10	9
IN FRONT OF-behind	11.5	5.5
BEFORE-after	11.5	15
HIGH-low	13	12
SIMILAR-different	14	7.5
DEEP-shallow	15	11

^a Stimulus word in capital letters.

rho = .61 (corrected for ties)

p<.02

Table 4. Order of difficulty within each language.
Production task.

Percentage of subjects responding correctly to different antonyms,
by language.

Swedish version	Finnish version	English test; Clark (1972) ^a
Sign ^b	Sign	Sign
BIG 78 + LONG 40 + HIGH 26	BIG 94 + LONG 62 + HIGH 52	BIG 95 + LONG 61 + HIGH 42
LONG 40 + WIDE 38 - THICK 82 + DEEP 6	LONG 62 + WIDE 30 - THICK 92 + DEEP 60	LONG 61 + WIDE 9 + THICK 23 + DEEP 14
IN 86 + ABOVE 40 + OVER 40	IN 100 + ABOVE 88 + OVER 80	IN 79 + ABOVE 16 + OVER 27
UP 80 + ABOVE 40 + OVER 40	UP 98 + ABOVE 88 + OVER 80	UP 82 + ABOVE 16 + OVER 27

^a Based on Clark's data; mean percentages of adult correct responses across age groups (1972).

^b Direction of difference as predicted by Clark (1972): +
Direktion of difference, contrary to predictions: -

Certain other oppositions are easier in L2 than L1. Three of these are easier also in absolute terms. Thus, more subjects produced LAST, AFTER and NARROW in Swedish than Finnish (see also, Table 4). The explanation for the success of LAST can probably be found in the wider syntactic application of the Swedish word (cf., Table 1). A similar explanation holds for the other two terms in that the Swedish term ("SMAL" and "EFTER" respectively) is more global than the Finnish one in terms of meaning potential). The simplicity of "SMAL" is also reflected in its divergence from the usual polarity pattern (cf., Table 2).

Shifting our focus from between-language to within-language variance, we find that by and large the differential mastery of word pairs is in accordance with Clark's (1972) predictions of complexity order (Table 4).

The Swedish and Finnish complexity orders diverge from English with respect to the relative position of THICK-THIN. However, (as shown in Table 1) THICK is a more global term in these languages than in English. So even though Swedish and Finnish express the THIN/LEAN distinction that is a fact of subordinate importance, since the THICK equivalents ("TJOCK" and "PAKSU") each have two opposites, whereas THICK has but one.

Error analysis

Certain errors occur in both language versions. It is interesting that the intrusion errors do not differ radically between the two languages as to type. What is, however, more striking is the finding that these intrusion errors are, in effect, ordered in a quite systematic fashion; i.e. the most common substitutes for the Swedish version are also most common in Finnish and, correspondingly, the least common ones are least common in both languages (Table 5).

Table 5. Rank order of substitutions, by language.
Production task.

Substitutions occurring in both language versions ^a		
Substitution	Swedish ranks	Finnish ranks
SMALL	1	1
LAST	2	4
THIN	3	2
DOWN (locative sense)	4 ("NERE")	3 ("ALHAALLA")
A LITTLE	5 ("LITE")	8 ("VÄHÄN")
SHORT	6.5	6
LOW	6.5	5
THICK	8	8
DOWN (directional sense)	9 ("NER")	8 ("ALAS")

^a Substitutions which occur at least twice for any of the given target words.

rho = .83 (corrected for ties)

p<.02

The largest inter-language difference, which involves the A LITTLE-equivalents can probably be accounted for by the more global semantic-syntactic associations of the Swedish term ("LITE") which has the same stem as the related adjective "LITEN" which covers both LITTLE and SMALL, whereas Finnish makes this latter distinction - "VÄHÄN"/"PIENI".

A more detailed analysis of the processes involved in substitution can be obtained by studying the relations between the substitutions produced and the respective expected words (Table 6). As can be seen, almost all substitutions agree with the replaced word as to polarity; i.e. negative terms are substituted by other negative terms (18/20 substitutes + 1 unclassifiable). Parenthetically, if a similar analysis is performed on Clark's 1972-data the same trend is revealed (17/17 substitutes appropriate as to polarity + 3 unclassifiable). The present results thus provide further support of the predicted polarity pattern. Moreover, the substitute word-class is appropriate in the majority of cases; prepositions replace prepositions, adjectives replace adjectives, adverbs replace adverbs. Also, the domain is generally appropriate; dimensional terms are replaced by other dimensional terms, locative terms by other locatives etc.

Within a given domain, the general pattern is shown to be that global concepts replace more differentiated ones; SMALL replaces LOW, SHORT (40 cases) but not vice versa except for 3 cases. BEHIND replaces LAST, AFTER (45 cases) but rarely the reverse (6 cases). Over-extension of a familiar term could be explained as a deliberate adaptive strategy when the appropriate term is not known. Yet, observations of the present subjects indicate that such substitutions are probably quite unconscious; e.g. the subject who responded UNDER first to ABOVE and then later to OVER whereupon he indignantly remarked "Why do you say that word again?" (assimilating the difference between the two Swedish stimulus words, "OVANFÖR" and "ÖVER"). The THIN-substitutes do not quite agree with the global-differentiated paradigm but this can be explained with reference to the somewhat different structure of THICK-THIN in Swedish and Finnish relative to English (cf., previous discussion).

Table 6. Substitutions, by expected words.

Children's substitution	Expected word (correct antonym)	
	Swedish version	Finnish version
SMALL	LOW (12) ^a , SHORT (8) LESS (8)	LOW (14), SHORT (6), LESS (4), THIN (1)
LAST	AFTER (18), UNDER (2) BEHIND (2)	AFTER (4), LAST (4) ^b
THIN	SHORT (11), LOW (3)	NARROW (12), SHORT (5)
DOWN (locative sense)	UNDER (10), BELOW (3)	UNDER (5), BELOW (4)
A LITTLE	LESS (7)	LESS (2)
SHORT	LOW (6)	THIN (3), LOW (2)
LOW	SHALLOW (6)	SHORT (3), THIN (3)
THICK	THIN (4)	THIN (2)
DOWN (directional sense)	UNDER (2)	UNDER (2)

BACK	LAST (4), BEHIND (4), AFTER (2)	
BAKFÖR (?) ^c	BEHIND (6)	
BACKWARDS	BEHIND (3)	
AFTER	BEHIND (4), LAST (3)	
LEAST	LESS (5), LOW (2)	
HIGH	SHALLOW (7)	
UNDER	BELOW (3)	
UNDERFÖR (?)	BELOW (3)	
BEHIND		AFTER (39), LAST (16)
SECOND		LAST (7)
SMALLER		LESS (4), SHORT (2)
QUITE DIFFERENT ("TOISENLAINEN")		DIFFERENT (2)

^a Number of times a substitution occurred for the word expected.^b Adjective forms (e.g. "VIIMEINEN") substituted for the appropriate adverbial form.^c Untranslatable substitutions are marked (?) for this and following examples; "BAKFÖR" and "UNDERFÖR" (below) are home-made expressions in accordance with the Swedish "OVANFÖR"-"NEDANFÖR" type pattern.

Table 6 shows certain language unique substitutions. However, a closer inspection of the relation between the substitutions and the expected words proves to be quite revealing. There is a close match between L1 and L2 substitutions as to their respective functional status. Thus:

Swedish version:

Finnish version:

BACK, "BAKFÖR(?)", BACKWARDS	+	BEHIND	replace AFTER, LAST
AFTER, BACK	+	SECOND	replace LAST
LEAST	+	SMALLER	replace LESS

There were no L1 intrusions in the L2 version or vice versa.

However, some children who could not produce certain antonyms in Swedish would spontaneously remark that they knew the response but in Finnish. This fact indicates that 'knowing' to the child is knowing in either language (not necessarily in the language spoken on the given occasion).

To some extent, the order of production is probably determined by the limited referential domain within the experimental situation. However, the correlation between order of presentation and order of difficulty is non-significant ($\rho = .37$ for the Swedish version; $\rho = .35$ for the Finnish version). Also, it could be argued that the order of stabilization of the different antonyms might be due to differences in the frequency of the terms in the languages to which the child has been exposed. That is, the more frequent words are also the ones that are stabilized first. However, this hypothesis does not predict either the occurrence of substitutions or the systematic order between these substitutions. Further, as pointed out by Clark (1972), it might be more meaningful to argue that word frequencies are the results of some semantic or cognitive complexity than the other way round.

To summarize, the present results support the complexity hypothesis with regard to predominance of positive over negative, on

one hand (polarity effects, Table 2), and with regard to general order of acquisition, on the other (Tables 3-6). These findings thus add weight to the idea that certain spatial concepts can be meaningfully ordered in terms of relative cognitive complexity and that this order is of a universal type in that similar predictions hold for different languages. Also, the fact that L1 and L2 concepts are similarly organized, with regard to acquisition order and substitution patterns, implies that the qualitative-difference hypothesis does not hold within this field of spatial concepts.

Child-generated systems of meaning and bilingual organization

Neither the complexity hypothesis nor the qualitative-difference hypothesis can explain inter-individual variation with regard to relative mastery on the antonym tasks. Mechanisms underlying these differences will be investigated in the following. It is assumed that degree of mastery will be related to experience of the world (age), on the one hand, and conceptual orientation, on the other. First, the age variable will be explored (Table 7).

As shown, all comparisons by age are significant. These age effects show that basic spatial terms are not acquired in an all-at-once way. There is a gradual increase in comprehension followed by greater production. Evidently, children do not learn such common terms as MORE-LESS, HIGH-LOW with ease. Even if these concepts are "natural" ones in the sense that they appear in many languages, they are not stabilized at a very early stage, the present subjects all being well past the initial stage of language acquisition. Also, they are older than the 4-5-year-olds in Clark's study (1972). In view of the quite common concepts involved and the age of the subjects, it is not a priori evident that there would be any age differ-

ences at all. The present results thus obviously have some negative implications for the speedy-acquisition hypothesis.

Table 7. Semantic operativity and age.

Operativity	Mean number of word pairs mastered, by age		Mann-Whitney U test (one tailed)
	6-year-olds ^a	8 year olds	
Comprehension			
Swedish	7.96	11.55	p<.001
Finnish	11.20	12.30	p<.009
Production			
Swedish	6.00	9.65	p<.001
Finnish	10.10	10.85	p<.031

^a One egological and 2 standard-logical subjects were dropped from the Swedish comprehension analyses; 2 egological and 3 standard-logical subjects from the Swedish production analyses (here and in the following) due to zero performance.

Also, analyses showed that the relative strength of child-generated systems of meaning (as indicated by type of conceptual orientation) exerted an influence on the child's concept acquisition (Table 8). As shown, this influence has primarily to do with the child's ability to operate in production with the concepts in question. There are in fact no significant differences between egological and standard-logical subjects with regard to comprehension. As pointed out earlier, conceptual orientation was explicitly defined in terms of the child's operation with known concepts as bases for his sorting strategies. The present findings substantiate the egologic/standard-logic distinction in that they demonstrate that the conceptual orientation primarily has to do with concept accessibility and not mere word knowledge in a more mechanical sense.

Table 8. Semantic operativity and conceptual orientation.

Operativity, by age-group	Mean number of word pairs mastered by con- ceptual orientation		Mann-Whitney U Test (one-tailed)
	Egological	Standard-logical	
6-year-olds			
Comprehension			
Swedish	8.13	7.75	n.s.
Finnish	10.63	11.86	n.s.
Combined score ^a	12.69	12.93	n.s.
Production			
Swedish	6.00	6.00	n.s.
Finnish	9.25	11.07	p<.01
Combined score	10.19	12.21	p<.01
8-year-olds			
Comprehension			
Swedish	10.83	11.86	n.s.
Finnish	11.33	12.71	n.s.
Combined score	13.17	13.64	n.s.
Production			
Swedish	8.17	10.29	p<.05
Finnish	9.17	11.57	p<.025
Combined score	11.33	13.79	p<.025

^a Word-pairs mastered in Swedish and/or Finnish

As indicated by the mean number of pairs mastered there is a greater discrepancy between comprehension and production among egological subjects than among standard-logical subjects. However, Table 8 does not indicate whether a given subject understands the concepts involved. Since it is a basic assump-

tion of this study that it takes quite a while for subjects to fully integrate newly acquired concepts; it would be of interest to study the relation between conceptual orientation and concepts produced from those that are in fact understood; i.e. from those that we know for certain that the subject comprehends (at least within the conditions of the present experiment). For the purpose of such an analysis, egological and standard-logical subjects were compared in terms of "production ratios" (Table 9). These analyses provide additional support for the egologic/standard-logic distinction in that they show more directly how standard-logic is related to stabilization.

Table 9. Production ratio, by language, and by conceptual orientation.

Language and age-group	Production ratio: number of word-pairs comprehended <u>and</u> produced / total number of pairs comprehended (percentages)		
	Egological group	Standardlogical group	Mann-Whitney U test (one-tailed)
6-year-olds ^a			
Swedish	49.58	60.45	p<.05
Finnish	70.31	74.50	n.s.
8-year-olds			
Swedish	59.83	74.43	p<.05
Finnish	67.00	78.21	n.s.

^a N = 23; (7 cases of zero performance in comprehension and/or production - cf., Table 7)

It is of interest to note that, whereas Table 8 revealed no significant differences between the younger egological and standard-logical subjects, with regard to Swedish production, Table 9

shows that, in fact, these two groups differ with regard to the production ratios.

Other things being equal, L1 concepts should be more stabilized than L2 concepts. A comparison between L1 and L2 production ratios for individual subjects in fact revealed this to be the case. Twenty-seven out of 38 relevant cases showed higher production ratios in Finnish than Swedish ($p < .007$, $z = 2.44$, sign test, one-tailed).

A different question has to do with whether those subjects who acquire L1 concepts at a faster rate than others will also be more proficient in L2. A Spearman rank order correlation was performed for each age group between Finnish and Swedish performance. Three correlations out of four were insignificant:

	Comprehension	Production
6-year-olds	$\rho = .26$, n.s.	$\rho = .27$, n.s.
8-year-olds	$\rho = .48$, $p < .05$	$\rho = .35$, n.s.

The correlations might have been higher if the analyses had been based on more differentiated rank orders. However, the low rate of association also reflects the genuine state of affairs. Inspection of individual performance showed that above-average performance in Finnish would often be associated with below-average performance in Swedish (even though superior performance in Swedish was related to above-average performance in Finnish). Mastery of Finnish was thus not related to mastery of Swedish in any unitary fashion. As previously indicated, this was in fact not to be expected, since younger children often cope quite satisfactorily in L2 settings by means of extralinguistic strategies - by relying on their construal of the context. As hinted elsewhere

(Aronsson, 1978), more mature construal of the context is one of the factors that might work against speedy L2 acquisition, since it will serve as an efficient alternative strategy. This is true for early L2 settings which make low demands on more elaborate verbal communication. In accordance with this line of reasoning, one would expect that the proportion of L2 knowledge relative to L1 knowledge will be less among preschool subjects than older ones. This can be examined by computing "Swedish-Finnish ratios" (Figure 3).

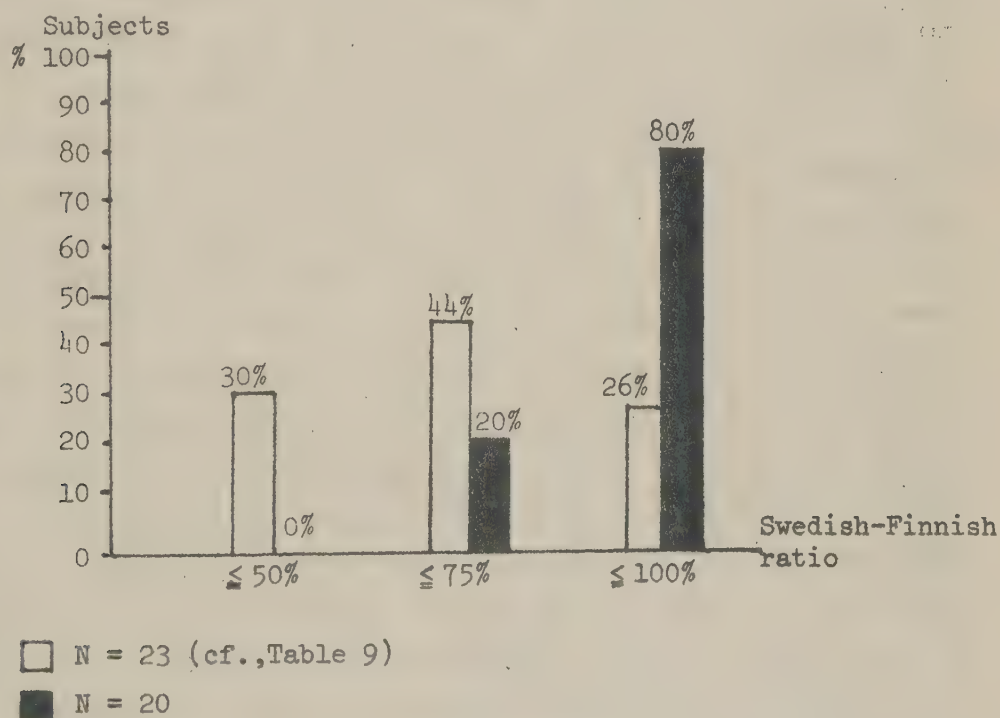


Figure 3. Number of correct pairs produced in Swedish relative to number of correct pairs in Finnish: "Swedish-Finnish ratio".

As can be seen from Figure 3, the relative mastery of Swedish is greater among the older subjects. This was also borne out by a χ^2 -analysis, comparing the 22 subjects who have higher than 75% mastery with the 21 subjects below ($p < .01$, $\chi^2_c = 10.38$, $df = 1$,

one-tailed). Again, these findings indicate slow and gradual rather than speedy L2 acquisition. It should perhaps be emphasized that all but one of the younger subjects had lived in Sweden for at least four years (20/23 were born in Sweden or immigrated during their first year of life).

C o n c l u s i o n s

The standard-logical orientation was meaningfully related to the gradual conventionalization of word concepts as evidenced in (i) the increasing integration of antonyms (with regard to appropriate position within the given word field), and (ii) the increasing availability of these terms in production. An objection to the present emphasis on stabilization processes might be that such results are a priori necessary and thus trivial. Such an objection would have been a valid one if the concepts involved had been more directly linked to previous exposure/non-exposure. It has here been assumed that knowing the meaning of such terms as HIGH-LOW is quite different from knowing the meaning of, for instance, AMBERGRIS, since one becomes familiar with ambergris in special low-frequency contexts to which most young children have not been exposed. It should perhaps also be pointed out that the relationship between the standard-logical orientation and mastery of antonyms is not a circular one. Standard-logic was defined in terms of sorting strategies, linked to language domains quite different from those employed in the antonym task (e.g. colour domain versus spatial domain). Yet, both types of performances reflect some kind of operative development which could be described as the gradual move toward greater context-independence.

As shown, the move toward greater context-independence involves similar step-by-step processes in both languages. The

present results thus go against the speedy-acquisition hypothesis in that they show that in certain important respects neither L2 nor L1 acquisition is a quick or easy affair. Also, the present findings provide ample support for arguments against the qualitative-difference hypothesis. With regard to the acquisition of spatial concepts, L2 acquisition apparently involves processes quite similar to those involved in L1 acquisition. Similarity in kind was evidenced in the advantage of the positive pole terms over the negative ones and in the general order of stabilization of meaning. In addition, the same errors occurred in both languages, similarly ordered. This ordering could possibly be explained away as artifacts of the limited referential domain within the experimental situation. However, this explanation does not account for the strikingly similar error patterns. The present findings can thus be regarded as evidence against the qualitative-difference hypothesis and in favour of the complexity hypothesis.

However, the acceptance of the complexity hypothesis does not necessarily imply that the present results can also be taken as unqualified support for the complementary semantic feature hypothesis (E. Clark, 1973). According to this hypothesis, the child learns to apply words to perceptual and cognitive events one semantic feature at a time. The present data do not justify acceptance (or rejection) of this hypothesis. On all accounts, the semantic feature hypothesis has certain weak points. First, from the theoretical perspective of Werner & Kaplan (1964), it would be more natural to describe the present data, and those of Clark, in terms of increasing differentiation; i.e. the child might operate with a whole set of features but only gradually be able to apply them in the prescribed way (according to the standard concepts). Clark (E. Clark, 1973) has cited over-extension data from child-speech samples in favour of the semantic

feature hypothesis, arguing that over-extension is indicative of fewer features. This line of reasoning ignores two problematic phenomena; first, under-extension is less easily noticed in children's spontaneous speech - if a given child fails to call a dog DOG (e.g. reserving DOG for big dogs) this is less conspicuous than if the DOG-label is extended to parrots or horses as in over-extension. Second, over- versus under-extension is to a certain degree a matter of perspective. For instance, when the children in the present investigation extended SMALL to instances where LOW would have been the appropriate term, this can be regarded as over-extension of SMALL but it can just as reasonably be regarded as under-extension of LOW (if it be the case that the child sometimes uses LOW appropriately).

The present findings are based on a somewhat artificial situation (producing antonyms in an experimental setting) which is obviously different from producing the same terms in "real life". However, this type of experimental performance was also related to the child's ability to utilize common concepts in a sorting task, which indicates that the antonym performance reflects something more than an incidental ability. Both types of performance are, of course, in a certain sense somewhat contrived ones (- yet, no more contrived than many school exercises where the child is required to use word concepts in vacuo). Indeed, much formal schooling demands precisely this of the child; that he should be able to use language concepts in a relatively context-independent fashion.

The present findings concern one type of linguistic competence (semantic) and only certain aspects of this competence. Other aspects of language development have been deliberately left out. As previously indicated, there has not been much in the

way of basic empirical research or theory on bilingualism and cognition. The building up of more coherent theory is a long-term enterprise. Only through empirical studies of limited aspects of bilingual functioning will it be possible to approach this goal. The present study is to be seen as one such contribution.

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